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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

S. 1085

AUTHORIZING APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991 FOR MILITARY ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILITARY CONSTRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DEPARTMENT OF ENERGY, TO PRESCRIBE PERSONNEL STRENGTHS FOR SUCH FISCAL YEARS FOR THE ARMED FORCES, AND FOR OTHER PURPOSES

PART 7
DEFENSE INDUSTRY AND TECHNOLOGY

MARCH 17; MAY 11, 16, 17, 31; JUNE 2, 1989

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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

FRIDAY, MARCH 17, 1989

U.S. Senate,
Subcommittee on Defense, Industry and Technology,
Committee on Armed Services,
Washington, DC.

FIRST ANNUAL CRITICAL TECHNOLOGIES PLAN

The subcommittee met, pursuant to notice, at 9:38 a.m., in room SR-222, Russell Senate Office Building, Senator Jeff Bingaman (chairman of the subcommittee) presiding.

Committee member present: Senator Bingaman.

Professional staff member present: Richard D. Finn, Jr.

Minority staff members present: Jonathan L. Etherton and Judith A. Freedman, professional staff members.

Staff assistants present: Elizabeth Ann Harlow and Mary J. Kampo.

Committee members' assistants present: Edward M. McGaffigan, Jr., assistant to Senator Bingaman; Donald A. Mitchell, assistant to Senator Glenn; C. Richard D'Amato, assistant to Senator Byrd; Charles Pearcy, assistant to Senator Lott; and Eric H. Thoemmes, assistant to Senator Coats.

OPENING STATEMENT BY SENATOR JEFF BINGAMAN, CHAIRMAN

Senator Bingaman. The subcommittee hearing will come to order.

I am informed that Senator Wallop is not able to be here. Senator Wallop is the ranking member of this subcommittee. He is also actively involved in the floor management of Congressman Cheney's nomination for Secretary of Defense, so he will be busy with that this morning.

The Defense Industry and Technology Subcommittee meets this morning to receive the first Critical Technologies Plan submitted in response to the provision that I authored in the Defense authorization bill last year.

I would like to start by commending Bob Costello, the Under Secretary of Defense for Acquisition, and Troy Wade, the Assistant Secretary of Energy for Defense Programs for delivering that report on time.

I think that is to be commended.

Today, their principal deputies, Milton Lohr and Richard Du Val, will be testifying for their respective departments.

I appreciate your being here today, gentlemen.

I also want to particularly note the work of the two people most responsible for keeping this effort on track in the past several months: Dr. George Millburn and Dr. Leo Young. Dr. Millburn is here with us today and we appreciate that.

In many ways, these gentlemen were breaking new ground as they put this report together, and they have done a remarkable job in this first effort.

Let me take a few moments at the outset of the hearing to outline why we asked for this report.

This subcommittee has responsibility for ensuring that the long-term underpinnings of our national security strategy, namely, our technology and our industrial bases, are kept strong. By this time last year, we had heard report after report that those underpinnings were eroding. For instance, the 1987 Defense Science Board summer study on Technology Base Management, which was chaired by MIT Provost John Deutsch, had concluded, and I will quote from that report, that it "concurs with the widely held perception and concern that our national technological advantage has eroded significantly in recent years." A good part of that erosion undoubtedly derives from the inadequate overall level of resources that we devote to our technology base, a problem that this committee has tried repeatedly to correct but with only moderate success.

The committee has also been concerned that DOD and DOE were not making the best use of all the resources available.

Time after time, I find myself in the position where technologies that seemed to be on everyone's list of truly critical technologies were, in my view, severely underfunded in the DOD request to the Congress.

At a hearing this time last year, for example, Dr. Cliff Duncan, Director of Defense Research and Engineering, testified that the DOD software producibility program was underfunded, despite the urgency of addressing that problem. Every one of the four congressional authorizing and appropriating committees ended up putting the necessary funds back into that program last year. But that experience, and others of a similar nature, left a real question in my mind as to whether we had a very well prioritized science and technology program in the Department of Defense.

This is when I came up with the idea of asking that we request the Department of Defense and the Department of Energy to jointly submit a Critical Technologies Plan that could identify the 20 technologies that DOE and DOD considered most significant to the long-term, qualitative superiority of our weapons systems.

I wanted DOE involved at the start to strengthen the coordination between the two agencies. I am convinced that DOE's weapons laboratories have much to contribute to meeting the Department of Defense's critical technologies needs.

We asked that the two agencies work together to identify the milestones they hope to reach in each of these technologies, and the resources which they and other agencies, such as NASA and NSF, were planning to devote to that purpose.

Since we have had so much testimony, including Dr. Costello's and Dr. Duncan's, that we have not paid enough attention in DOD research programs to process or manufacturing technologies, we specifically asked that they be given equal weight with product technologies in considering candidates for inclusion in this plan.

Finally, we asked for a comparison of where this Nation stood on each of these technologies, vis-a-vis other nations around the world.

In my view, the two departments have done a remarkable job in getting this report in on time and with so much substance to it.

Starting with today's hearing, we will be looking for comments on this report from the rest of the science and technology community. I personally plan to circulate it widely for comment, and I plan to have at least one hearing in the latter half of April to go over some of the more significant comments that have been made.

I hope this comment process can lead to even stronger reports in future years.

We may have additional members attend today as we go forward in the presentations.

Senator Wallop has a prepared statement for the hearing record which will be included at this time.

[Prepared statement by Senator Wallop follows:]

PREPARED STATEMENT BY SENATOR MALCOLM WALLOP

Mr. Chairman, I want to commend you for calling this hearing today on the first Department of Defense Critical Technologies Plan. Although I was not a member of the committee during the last Congress, it is my understanding that you were the father of the requirement for the Department of Defense to develop this plan in consultation with the Department of Energy.

The apparent lack of coordination among the various defense-related research activities within the Department of Defense and the Department of Energy and the need for a more long-term focus for such efforts provided the strong justification for the development and execution of this plan. This first report and those that we shall receive annually should serve as a roadmap for the Congress and the executive branch to follow in the oversight of our technology base programs.

The development and execution of programs influenced by the Critical Technologies Plan raises a number of questions that we will have to address. For example, how are we to ensure that there is an effective mechanism to translate the Critical Technologies Plan into effective research programs? How does the development of this plan at the level of the Office of the Secretary of Defense affect the respective management roles of research agencies in OSD and in those in the services? What is the relationship between the Critical Technologies Plan and the broader focus of the Defense Department's Science and Technology investment strategy? Finally, how do we provide an effective long-term focus to our basic research efforts while ensuring that the defense research community is aware of and can take advantage of unanticipated breakthroughs from outside its organizations?

I look forward to hearing the presentation of the witnesses today on the efforts of the Department of Defense to better coordinate their basic research activities. Mr. Chairman, I look forward as well to working with you and the other subcommittee members to sort out the issues involved in the management of the defense technology base. We have a fundamental responsibility to ensure that our Nation retains its leadership position in the development and production of weapon systems incorporating cutting-edge technologies.

Senator BINGAMAN. Let me now call on Mr. Milton Lohr, the Deputy Under Secretary of Defense for Acquisition, for his statement.

I understand that you will make a brief statement and turn it over to Dr. George Millburn, who will go into a more detailed briefing on the Critical Technologies Plan. Then, as I understand it, Mr.

Du Val will make a brief statement following Mr. Lohr's statement.

Mr. Lohr, thank you for being here. We look forward to your comments.

STATEMENT OF MILTON LOHR, PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION)

Mr. LOHR. Thank you very much, Mr. Chairman.

It is very pleasant to be here today on a subject that people both in the Government and industry are so actively interested in.

This plan was prepared in response to the Fiscal Year 1989 Defense Authorization bill, and, as you mentioned, Dr. George Millburn, our Deputy Director for Research and Advanced Technology, will be discussing it at the conclusion of my opening comments.

The Critical Technologies Plan identifies 22 technologies which we consider to be those most essential to develop in order to assure the long-term, qualitative superiority of U.S. weapon systems.

This plan was developed by the Department of Defense with the participation and cooperation of the Department of Energy.

You have the unclassified portion of the report, and we have provided an additional 50 copies for the committee's use.

I should also note that a classified addendum will be available next month, which will amplify on certain sensitive aspects of the plan, but will not affect the 22 technologies which we have identified as those that are the most essential.

The plan does not consider the nuclear weapons nor their effects because of the special nature of these technologies.

It also does not include any of the technologies which have special security restrictions. Most of the work we have identified is unclassified, and it is only in the details of certain areas, such as signature control and advanced sensors, that the efforts are classified.

The identification of the 22 technologies was based on the planning and the investment strategy which is currently in use for science and technology programs in the Department of Defense.

In essence, it involves a close-coupled and interactive process between the technologists in the laboratories and those in the militarily operational organizations. Dr. Millburn will describe this process in considerable detail during the briefing.

I would also like to caution that the absence of a technology from the specific list—and I'm sure that we'll have a lot of comments on those—does not necessarily mean that it is not important. For example, knowledge of the ocean floor can vastly affect the ability to detect submarines. Ducting over the ocean surface, can multiply the radar range for surface ship detection. If we used a different set of selection criteria, these technologies could easily have been listed as critical, as could others relating to the environment.

In addition, technologies to protect against such superior weapons as high energy lasers or high power microwaves, as well as against chemical and biological warfare, may also be considered critical, although they are not specifically listed in the plan.

I believe that no critical technology list can be considered as complete or comprehensive. The technologies identified here are those currently judged by certain criteria to be most essential for the long-term qualitative superiority of our weapons systems.

They do not constitute a complete list of important and supporting technologies.

Even more importantly, these technologies cannot be applied effectively to support the development of a new or improved weapon system without the substantial infrastructure represented by the remainder of the science and technology program. For example, radars and sensors, no matter how advanced, obviously cannot be used effectively without platforms to carry them or weapons to deliver ordnance on target, or displays and information processors to provide information for target detection and identification.

As will be discussed later in a more complete description of the plan, the funding levels for each of the 22 critical technologies are given in the fiscal year 1990 budget submitted by the President in January. However, the nature of our current process for tracking funds is not conducive to extracting information as a function of the specific technologies identified in the plan today.

Historically, we have tracked funds by project and line item, and these technologies are imbedded in them. So, therefore, the funding estimates that are contained in the plan represent our best efforts to get some assessment of the total dollars that are in each of the technologies. Subsequent to the completion of this plan, we now have action underway so we can identify the specific projects, how they all tie together, and how they are sorted by the individual technologies. We would expect that the services then would construct their programs in order to accomplish the same thing.

In summary, the Critical Technology Plan does not endorse one technology over another, but does identify the key performers in the larger group of all important technologies. A well-balanced science and technology program is essential to provide the basis necessary to translate those technologies that ultimately prove to be required for achieving high-quality weapons with superior operational effectiveness at a cost that we can afford.

Mr. Chairman, this completes my opening remarks. I would like to turn this over to Dr. Du Val for his comments.

[The statement of Mr. Lohr follows:]

STATEMENT ON CRITICAL TECHNOLOGIES PLAN

BY

MR. MILTON L. LOHR

DEPUTY UNDER SECRETARY OF DEFENSE

FOR ACQUISITION

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

I. INTRODUCTION

I AM PLEASED TO BE HERE THIS MORNING TO DISCUSS WITH YOU THE FIRST ANNUAL CRITICAL TECHNOLOGIES PLAN. THIS PLAN WAS PREPARED IN RESPONSE TO THE FISCAL YEAR 1989 DEFENSE AUTHORIZATION BILL, SECTION 823. DR. GEORGE MILLBURN, DEPUTY DIRECTOR DEFENSE RESEARCH AND ENGINEERING (RESEARCH AND ADVANCED TECHNOLOGY), IS ACCOMPANYING ME AND WILL PROVIDE A DETAILED BRIEFING IN THE CRITICAL TECHNOLOGIES PLAN.

THE CRITICAL TECHNOLOGIES PLAN IDENTIFIES 22 TECHNOLOGIES "CONSIDERED TO BE THE TECHNOLOGIES MOST ESSENTIAL TO DEVELOP IN ORDER TO INSURE THE LONG-TERM QUALITATIVE SUPERIORITY OF UNITED STATES WEAPON SYSTEMS." THE PLAN WAS DEVELOPED BY THE DEPARTMENT OF DEFENSE WITH THE PARTICIPATION AND COOPERATION OF THE DEPARTMENT OF ENERGY.

YOU HAVE THE UNCLASSIFIED PORTION OF THE PLAN AND WE HAVE PROVIDED AN ADDITIONAL 50 COPIES FOR THE COMMITTEE'S USE. A CLASSIFIED ADDENDUM WILL BE AVAILABLE NEXT MONTH WHICH WILL AMPLIFY ON CERTAIN SENSITIVE ASPECTS OF THE PLAN, BUT WILL NOT AFFECT THE 22 TECHNOLOGIES WE HAVE IDENTIFIED AS "MOST ESSENTIAL."

THE PLAN DOES NOT CONSIDER NUCLEAR WEAPONS NOR THEIR EFFECTS BECAUSE OF THEIR SPECIAL NATURE. IT ALSO DOES NOT

INCLUDE ANY TECHNOLOGIES WHICH MAY HAVE SPECIAL SECURITY RESTRICTIONS. MOST OF THE WORK IN THE 22 TECHNOLOGIES WE HAVE IDENTIFIED IS UNCLASSIFIED. IT IS ONLY IN THE DETAILS OF CERTAIN AREAS SUCH AS SIGNATURE CONTROL AND ADVANCED SENSORS THAT THE EFFORTS ARE CLASSIFIED.

IDENTIFICATION OF THE 22 MOST ESSENTIAL TECHNOLOGIES WAS BASED ON THE PLANNING AND INVESTMENT STRATEGY WE CURRENTLY USE FOR THE SCIENCE AND TECHNOLOGY (S&T) PROGRAM IN THE DEPARTMENT OF DEFENSE.

OUR S&T PLANNING PROCESS IS AN ITERATIVE, INTERACTIVE PROCESS IN WHICH TECHNOLOGY MANAGERS CHOOSE BETWEEN MANY ALTERNATIVE AND COMPETING TECHNOLOGIES IN ORDER TO RESPOND TO GUIDANCE FROM MILITARY PLANNERS AND POLICY MAKERS.

OUR FIGHTING FORCES MUST RESPOND THROUGHOUT THE SPECTRUM OF CONFLICT FROM TERRORIST ACTION TO GLOBAL CONFLICT. OUR PLANNING BEGINS WITH OUR ESTIMATE OF CURRENT NATIONAL DEFENSE DEFICIENCIES IN WARFIGHTING CAPABILITIES AND CURRENT THREAT PROJECTIONS.

WE CONDUCT A TOP-DOWN AND BOTTOM-UP, INTERACTIVE STRATEGIC PLANNING PROCESS FOR SCIENCE AND TECHNOLOGY. IN THIS PLANNING PROCESS, THE MILITARY SERVICES AND DEFENSE AGENCIES WORK WITH MY OFFICE TO JOINTLY DEVELOP INVESTMENT STRATEGIES THAT ARE RESPONSIVE TO THE DEFENSE GUIDANCE.

THIS PROCESS MAKES S&T INVESTMENT ACTIVITIES MORE VISIBLE TO BOTH PLANNERS AND USERS. THE CRITICAL TECHNOLOGIES PLAN HAS THE SAME BASIC OBJECTIVES AS THE INVESTMENT STRATEGY, AND IS A NATURAL OUTPUT OF OUR EXISTING DoD PLANNING PROCESS.

I WANT TO CAUTION YOU THAT ABSENCE OF A TECHNOLOGY FROM THE LIST DOES NOT MEAN IT IS "NOT IMPORTANT." FOR EXAMPLE, KNOWLEDGE OF THE OCEAN FLOOR CAN VASTLY AFFECT THE ABILITY TO DETECT SUBMARINES AND DUCTING OVER THE OCEAN SURFACE CAN MULTIPLY THE RADAR RANGE FOR SURFACE SHIP DETECTION. WITH DIFFERENT SELECTION CRITERIA, THESE TECHNOLOGIES COULD HAVE BEEN LISTED AS CRITICAL, AS COULD OTHERS RELATING TO THE ENVIRONMENT. IN ADDITION, TECHNOLOGIES TO PROTECT AGAINST SUCH SUPERIOR WEAPONS AS HIGH-ENERGY LASER BEAMS OR HIGH-POWER MICROWAVES, AS WELL AS AGAINST CHEMICAL AND BIOLOGICAL WARFARE, ALTHOUGH NOT SPECIFICALLY LISTED, MAY ALSO BE CONSIDERED CRITICAL.

I BELIEVE NO CRITICAL TECHNOLOGIES LIST CAN BE CONSIDERED AS COMPLETE OR COMPREHENSIVE. THE TECHNOLOGIES IDENTIFIED HEREIN ARE THOSE TECHNOLOGIES JUDGED AGAINST CERTAIN CRITERIA TO BE MOST ESSENTIAL FOR THE LONG-TERM QUALITATIVE SUPERIORITY OF U.S. WEAPON SYSTEMS. THEY DO NOT CONSTITUTE A COMPLETE LIST OF IMPORTANT AND SUPPORTING TECHNOLOGIES.

EVEN MORE IMPORTANTLY, THESE TECHNOLOGIES CANNOT BE APPLIED EFFECTIVELY WITHOUT THE SUBSTANTIAL INFRASTRUCTURE REPRESENTED BY THE REMAINDER OF THE S&T PROGRAM. FOR EXAMPLE, RADARS AND SENSORS, NO MATTER HOW ADVANCED, CANNOT BE USED EFFECTIVELY WITHOUT PLATFORMS TO CARRY THEM, WEAPONS TO DIRECT FOR TARGET KILL, OR DISPLAYS AND INFORMATION PROCESSORS TO SUPPLY THEIR DATA IN A TIMELY AND EFFECTIVE MANNER.

AS WILL BE DISCUSSED LATER IN A MORE COMPLETE DESCRIPTION OF THE PLAN, FUNDING LEVELS FOR EACH OF THE 22 CRITICAL TECHNOLOGIES ARE GIVEN FOR THE FY90 BUDGET SUBMITTED BY THE

PRESIDENT IN JANUARY. HOWEVER, THE NATURE OF OUR PROCESS FOR TRACKING FUNDS IS NOT CONDUCIVE TO EXTRACTING INFORMATION AS A FUNCTION OF CRITICAL TECHNOLOGIES OR AT THIS LEVEL OF DETAIL. WE TRACK FUNDS BY PROJECT AND LINE ITEM AND THESE TECHNOLOGIES ARE EMBEDDED IN THEM. THUS THE FUNDING ESTIMATES REPRESENT OUR BEST EFFORTS TO BE RESPONSIVE TO THE CONGRESS BUT SHOULD NOT BE REGARDED AS PRECISE.

IN CONCLUSION THE CRITICAL TECHNOLOGIES PLAN DOES NOT ENDORSE ONE TECHNOLOGY OVER ANOTHER, BUT DOES IDENTIFY THE "STAR" PERFORMERS IN A LARGER TEAM OF ALL-IMPORTANT TECHNOLOGIES. A WELL-BALANCED S&T PROGRAM IS ESSENTIAL TO PROVIDE THE BASIS WHICH WILL BE NECESSARY TO TRANSLATE THOSE TECHNOLOGIES WHICH ULTIMATELY PROVE TO BE "MOST ESSENTIAL" INTO BETTER WAR-FIGHTING CAPABILITIES FOR OUR FIGHTING MEN AND WOMEN. EVOLUTIONARY DEVELOPMENTS AND STEADY PROGRESS ARE AS IMPORTANT AS TECHNOLOGICAL BREAKTHROUGHS. THE EFFECT OF "COMPOUND YEARLY IMPROVEMENTS" CAN BE DRAMATIC OVER A LONG PERIOD OF TIME. STABILITY IN FUNDING AND PERSERVERANCE PAY OFF, AND THESE ARE IMPORTANT PARTS OF OUR INVESTMENT STRATEGY.

THIS CONCLUDES MY REMARKS. DR. MILLBURN IS PREPARED TO BRIEF THE SUBCOMMITTEE AT THIS TIME.

Senator BINGAMAN. Thank you.

Mr. Du Val, we are glad to have you here. Go right ahead.

STATEMENT OF RICHARD A. Du VAL, ACTING DEPUTY ASSISTANT SECRETARY OF ENERGY FOR DEFENSE PROGRAMS (OPERATIONS)

Mr. DU VAL. Thank you, Mr. Chairman.

The Department of Energy and the Office of Defense Programs are pleased to be a part of this process and have worked hard to fulfill its mandate to consult with the Department of Defense in the preparation of this document.

Defense Programs considers technology, including nuclear weapons technology, to be central to U.S. national security.

As Mr. Lohr has pointed out, nuclear weapons technology was not included in this study. On the other hand, elements of the Department of Energy-Department of Defense Joint Advanced Conventional Munitions Program have been included.

We have played a consultative, advisory, and supportive role in preparing this plan. We have participated in all the working group meetings and reviewed all the technology areas, and we have participated in assessing the relative U.S. technological position.

So, as good as it is, we are certain that there will be substantial improvement in future plans as the process continues of refining it within our organizations, and equally, or even more importantly, as we receive comments back from the science and technology community.

I appreciate the opportunity to be here, Mr. Chairman.

This concludes my remarks.

Senator BINGAMAN. Thank you very much.

Dr. Millburn, we welcome you and compliment you on the report.

STATEMENT OF GEORGE P. MILLBURN, DEPUTY DIRECTOR, DEFENSE RESEARCH AND ENGINEERING (RESEARCH AND ADVANCED TECHNOLOGY), ACCOMPANIED BY LEO YOUNG, STAFF SPECIALIST, DEFENSE RESEARCH AND ENGINEERING (RESEARCH AND ADVANCED TECHNOLOGY)

Dr. MILLBURN. Thank you, Mr. Chairman. I am very happy to be here and I have Dr. Leo Young at my right, who expended a great deal of effort putting together the plan.

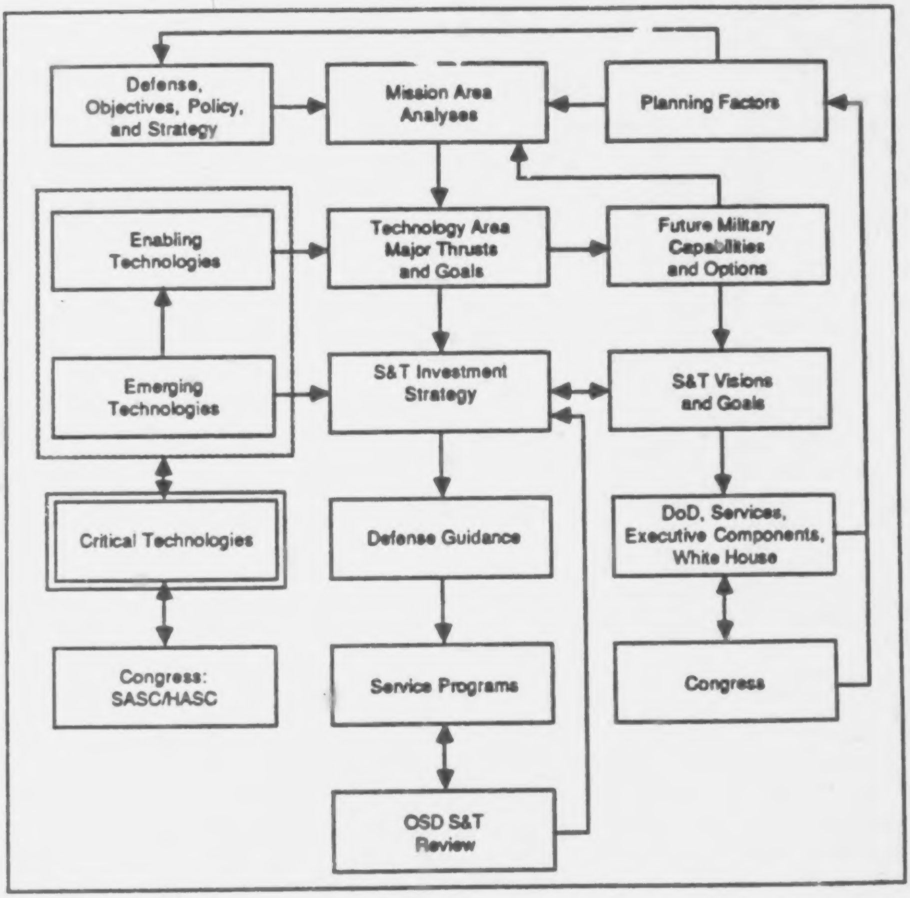
Senator BINGAMAN. I know that both of you have, and we appreciate it very much.

DEPARTMENT OF DEFENSE—CRITICAL TECHNOLOGIES PLAN

Dr. MILLBURN. I would like to begin the briefing by pointing out that one of the first decisions we had to make was what is a technology. Of course, there are many ways to define technologies, and, typically, they are often referred to as space technology, or air defense technology. We made the decision that we would not address technologies in that general sense, but in a very specific sense.

As you will see, we have technologies that are identified, for example, as integrated optics and as high powered microwave technologies, which are very specific, aimed at specific technology developments.

S & T INVESTMENT STRATEGY


Defense, Objectives, Policy, and Strategy
Mission Area Analyses
Planning Factors
Enabling Technologies
Technology Area Major Thrusts and Goals
Future Military Capabilities and Options
Emerging Technologies
S&T Investment Strategy
S&T Visions and Goals
Critical Technologies
Defense Guidance
DoD, Services, Executive Components, White House
Congress: SASC/HASC
Service Programs
Congress
OSD S&T Review

As Mr. Lohr commented, the development of the Critical Technologies Plan is based on the investment strategy planning process that we go through in our science and technology program.

This is the chart which is in the report. It illustrates, in general terms, the procedure we go through.

We begin, of course, with planning factors, which are changing threat considerations, the national priorities that are set by the President. We follow that with the defense objectives, policy, and strategy, as established by the Secretary of Defense. In turn, from these, we work with the mission area analyses, which are generally performed by the Joint Chiefs of Staff and by the three services.

From these, we jointly, working with the three military departments, identify areas of technology thrusts, technology requirements, and set up goals.

From that, again, working closely with the three military departments, we develop our investment strategy jointly.

As a result of that, the Secretary of Defense issues, for each budget cycle, defense guidance detailing what should be done to accomplish the investment strategy, in this case for the science and technology program. You'll find the programs are put together by the three services, and those are reviewed by my office, in the case of science and technology, for conformance with guidance and other policy directives.

To the left of the chart, I have added the considerations that go into identifying from this planning process the critical technologies. So we discuss the enabling technologies, those technologies which will enable us to do new things, which cannot be considered to be requirements based on mission area analyses, but technologies that we believe will address shortfalls in our ability to address those missions.

Then there are the emerging technologies, which, by and large, are those which are recognized as technologies under development, which will be useful in military applications.

That is the process we have gone through to develop our Critical Technologies Plan, which we have submitted to you.

Senator BINGAMAN. Let me just interrupt you for a moment. You have on the chart three different designations: enabling technologies, emerging technologies, and critical technologies.

Would you just elaborate a little bit on the distinction that you assign to those three different categories?

Dr. MILLBURN. It might be useful if I gave you specific examples.

An enabling technology, for example, would be biotechnology. It is an area of rapid growth in technology capabilities, one for which we have not identified specific applications in terms of weapons, or in terms of developing specific weapon components. That is something we are identifying now, programs to do what we would call generic engineering, for example, to develop sensors based on biological, generic, engineering principles. They may enable us to perform functions that we do today, but much cheaper; more effective and at lower cost.

The emerging technologies, for example, would be radar technologies that are developing very high resolution radars, which also happens to be in one of the critical technologies. These are technologies that are under development, which we understand in general terms and understand how to apply them. But they are in continuing development, and the role they will play is fairly well recognized within the defense community.

From those two, we have selected the critical technologies, and those are the ones that we believe offer a significant improvement either in our capabilities or in our performance criteria. I will get into that on the next chart.

Significant technologies, on our definition, are those that will make about a factor of three difference in one of these four criteria that we have used to select what we consider to be critical technologies.

Senator Bingaman. Is that chart in the study?

Dr. Millburn. Yes.

Senator Bingaman. On which page?

I'm told that it is on page 5. Thank you.

Dr. Millburn. Page 4. Those are the same criteria.

SELECTION CRITERIA

For the purposes of this report, critical technologies are selected on the basis of one or more of the Performance and Quality Design criteria listed below:

Performance Criteria

1. Technologies that enhance performance of conventional weapons systems
2. Technologies that provide new military capabilities

Quality Design Criteria

3. Technologies that improve weapon systems availability and dependability
4. Technologies that improve weapon systems affordability.

We consider under performance, technologies that will enhance what we currently can do with conventional weapons systems, as well as technologies that will give us completely new military capabilities.

One of the distinctions between critical technologies and emerging technologies would be exemplified by the development, for example, of jet engines. We have that, in a certain sense, under our critical technologies. But, by and large, the improvements in jet engine technology will be relatively modest. They will not be factors of three improvement in cost, in reliability, or in performance. But they will be significant.

I think that is illustrated within the last 30 or 40 years. The steady development of our turbine engines has resulted in significantly greater capability than anyone would have predicted 30 or 40 years ago.

It is a steady, year-after-year, improvement of several percent that over a period of 30 and 40 years compounds into significant advances in capability and is, I think, the reason that our aircraft today are superior to any other aircraft in the world, both from the standpoint of our military aircraft and our commercial aircraft.

Again, in conformity with the requirement to consider processes, we identify two quality design criteria. Those are technologies that improve the availability and dependability of weapons systems. By availability, I include, of course, the fact that they must be reliable, they must be available in the field when they are needed, and they must be operable by the people in the field who have to operate these technologies.

The backbone of that are some technologies that we did not include. Training technology, for example, is essential to the use of our new weapon systems. So, we have to be certain that, as we develop our new weapon systems, the new technologies, we also develop our training capabilities and our doctrine to employ those in the field.

Affordability is very important. I think that that is a case of how many we have versus how good they are. Obviously, you can have very, very good weapons, but, if you cannot afford to buy them, they are not going to be very useful in the field.

CRITICAL TECHNOLOGIES

MICROELECTRONIC CIRCUITS AND THEIR FABRICATION

PREPARATION OF GALLIUM ARSENIDE AND OTHER SEMICONDUCTOR COMPOUNDS

SOFTWARE PRODUCIBILITY

PARALLEL COMPUTER ARCHITECTURES

MACHINE INTELLIGENCE/ ROBOTICS

SIMULATION AND MODELING

INTEGRATED OPTICS

FIBER OPTICS

SENSITIVE RADARS

PASSIVE SENSORS

AUTOMATIC TARGET RECOGNITION

Dr. MILLBURN. The next two charts will list the 22 critical technologies.

After I show these two, I will go through three more charts and discuss each of these in a little more detail.

CRITICAL TECHNOLOGIES (Con't)

PHASED ARRAYS

DATA FUSION

SIGNATURE CONTROL

COMPUTATIONAL FLUID DYNAMICS

AIR BREATHING PROPULSION

HIGH POWER MICROWAVES

PULSED POWER

HYPERVELOCITY PROJECTILES

HIGH-TEMPERATURE/HIGH STRENGTH/LIGHT WEIGHT COMPOSITE MATERIALS

SUPERCONDUCTIVITY

BIOTECHNOLOGY MATERIALS AND PROCESSING

Again, one of the charts that we have included in our report—this is on page 7 of the report—is the list of the critical technologies and their objectives. The next three charts will briefly summarize that particular chart in the report.

As I go through this, I want to bring out some factors which are not obvious, that is, the interrelationship among these critical technologies.

We have the first seven or eight of these technologies very closely related to one another, and, in fact, are part of what could be considered the revolution in our capability of information processing and information handling.

There are also technologies that support many applications, not a single specific application, but that will impact upon very many of them.

TECHNOLOGY OBJECTIVES

MICROELECTRONIC CIRCUITS: High speed computers, sensitive receivers, automatic control, etc.

GALLIUM ARSENIDE AND OTHER COMPOUND SEMICONDUCTORS: High speed signal processing, millimeter wave radar, optics, etc.

SOFTWARE PRODUCIBILITY: Affordable and reliable software in a timely fashion.

PARALLEL COMPUTER ARCHITECTURES: Ultra-high-speed computing.

MACHINE INTELLIGENCE/ROBOTICS: Build human intelligence into mechanical devices.

SIMULATION AND MODELING: Testing concepts and designs without expensive replicas.

INTEGRATED OPTICS: Optical memories and optical and signal data processing.

FIBER OPTICS: Ultra low-loss fibers and optical components for communications, navigation, etc.

Microelectronic circuits will be very useful in high speed computers and more sensitive receivers and is essentially a fabrication technology. It is a process technology that we are developing. The emphasis here is on developing better, more reliable methods to produce silicon for the microelectronic circuits, silicon-on-insulator technology, to provide for integrated circuits that will be less susceptible to interference in weapons applications and more resistant to damage from either natural or man-made radiation, which may be present on the battlefield itself.

The second one is gallium arsenide and other semiconductors, which are based on compounds. The essential distinction between silicon and gallium arsenide is that silicon is an element, a single element, while gallium arsenide is made up of two elements. It is a much more difficult fabrication process. Again, this critical technology is primarily concerned with how we will manufacture gallium arsenide for use in integrated circuits and other types of semiconductor applications.

One of the major advantages of gallium arsenide is the increased speed. The application of gallium arsenide will result in signal processing, data processing, which is about seven times faster than that which is achievable with silicon. It also is more resistant to radiation, so we will be able to develop integrated electronic circuits, that will survive better in the battlefield environment and in the radiation environment that we typically encounter in space applications.

I think the best way to illustrate the difference is to say that silicon has been around for 20 or 30 years, and in that time period, we have spent probably on the order of $1 billion to characterize the material, so that we understand how to use it, how to apply it in our engineering applications.

We now must characterize gallium arsenide in much the same way over a period of some years before we can achieve the same degree of reliability and reproducibility of gallium arsenide chips.

A third critical technology is one that has been discussed a great deal in the last year. In fact, the Defense Science Board has studied this problem for the Department of Defense. The latest is a special group that reviewed the status of software for us late last May and the first of June.

Our objective here is to produce reliable, affordable, and secure software, and to reduce costs. We would like to produce software which is also reusable, so that each time we apply a technology program, there is no need to develop a completely new software program.

Examples of efforts in this are the Ada Joint Program Office, the application of Ada to defense computers, the STARS program, and the Software Engineering Institute.

Closely allied with the software is the parallel computer architectures, number four in our list.

Senator BINGAMAN. Before you move on, may I just ask a question in regard to software producibility. In many of the technologies, you refer to the state of the research activity or technology development in Japan. I did not see that under software producibility.

Was that just an oversight, or was there some reason why you did not include a description of Japan's activities referred to there?

Dr. MILLBURN. The essential difference is that in computer technology per se, the Japanese are pushing us very hard. In the software technology, they are not yet capable of pushing us hard.

They are developing their software capability, and in some years they may be in a position to compete with us. But currently they are not in a position to compete with us when it comes to software development. They are doing things that we have not done because of the nature of their culture and their language. So they are developing software, for example, that will handle their graphic representation, rather than the way we develop it.

I think if we continue with a strong effort in software, we will be able to maintain our lead in the software development areas. That is one of our primary objectives.

Senator BINGAMAN. So not referring to them here was a conscious decision?

Dr. MILLBURN. Yes.

The parallel computer architectures is a very important technology. This is an effort, essentially, to greatly increase the speed at which we can do computations. Currently, we have computers that do about 10 billion operations per second. We will be able to increase that by 1,000-fold, if we are successful in developing this type of architecture. There also will be achieved with that about a 10-fold reduction in the cost of computing. A very important technology for certain applications—later, I will mention a technology called computational fluid dynamics. This is a technology which is very important for the development of such hypersonic capabilities as a national aerospace plane. But also, in order to be able to apply that type of computational capability, we will have to draw upon the capabilities demonstrated by parallel processing.

Other aspects are anti-submarine warfare and automatic target recognition, which are first class problems.

Machine intelligence and robotics is, essentially, the attempt to apply "artificial intelligence" or the technologies that have been developed over the years under that label to defense applications. We'll be using both artificial intelligence developments and the development of expert systems. This is primarily an integration process: How do we take these technologies and build them into robotics and machines which can help us with our battlefield management.

At the same time, this technology will be very effective in reducing maintenance costs and reducing logistics costs. So it meets our criteria both for processes and for affordability.

Senator Bingaman. You would include the strategic computing program as part of this?

Dr. Millburn. Yes, very much so. DARPA has an excellent program, and, of course, the parallel computer architecture is completely a DARPA program, and the strategic computing program is very much a part of this whole effort. This affects some of the man-machine interfaces that we are concerned about.

We are also concerned in the next technology, simulation and modeling, with the man-machine interface program. We will have to develop a technology that is able to do both hardware simulation and analytical simulations.

We have, of course, used hardware simulations, particularly in our aircraft development, over the years. We are now getting extremely competent in very realistic simulation of the hardware and of the missions that our pilots have to perform.

The analytic simulations, the models that we are developing, will greatly reduce the cost of training, and particularly will give us training capabilities that we have not had up to the current time in terms of war gaming and training commanders from headquarters down to corps, division, and even battalion level, in how to use the information that we are going to be able to give them, with the information processing technology that is under development.

We are going to have to be able to do that in a much more effective way, and this is a very important part of training individuals and teams in how to use that type of information.

Integrated optics, the next critical technology, goes by many names. It's called optronics, in some places, and photonics in others. It is, essentially, the marriage of optical and electronic processes, capabilities, both in storage memories and in data processing capabilities.

We will eventually, if we are successful in this technology, have processing speeds a hundred times faster than we can do today, which is very important on the battlefield for real-time display of information and for rapidly changing information.

We also will develop data storage discs about so large (indicating), 14 inches or so, about the size of a long playing record today, which will contain 120 gigabytes of information. This will give individual battlefield commanders more information than they would have available under any circumstances in the past. The commander will be able to bring, instantaneously, or within a few seconds, up detailed maps of areas that he may have to engage in.

Optical memories and signal processing represent very, very important technology that is still, in many respects, in its infancy.

Fiber optics is very closely related in the sense that it does, of course, apply optical technologies. But the primary purpose here is the transfer of information, rather than the production or storage of it. We will be able to transmit the information with 10 times the present channel capacity per line, eventually with 10,000 times the capacity we have per line—at a 10th of the error rate, which is very important. Information that is erroneous is not effective on the battlefield, obviously.

At the same time, we will be able to have the capability of transmitting information at very low loss levels, so we can have very high capacity communication lines without repeaters required in the interim.

This will be useful in submarine detection, for example; also extremely useful in communication lines, and will have its primary application in the communications field.

TECHNOLOGY OBJECTIVES (CON'T)

SENSITIVE RADARS: Detection of low-observable targets, Non-cooperative identification.

PASSIVE SENSORS: Sensors not needing to emit signals to detect targets, monitoring the environment, or determine status or condition of equipment.

AUTOMATIC TARGET RECOGNITION: Near real time automation of detection, classification, tracking of targets.

PHASED ARRAYS: Improved radar and underwater search and surveillance.

DATA FUSION: Machine integration and interpretation of data and its presentation in convenient form to the human operator.

SIGNATURE CONTROL: Ability to control the target signature (radar, optical, acoustic, other) and thereby enhance the survivability of vehicles and weapon systems.

COMPUTATIONAL FLUID DYNAMICS: Modeling of complex fluid flow to make dependable predictions by computing, thus obviating facilities and experiments

AIR BREATHING PROPULSION: Light weight, fuel efficient engines.

The next set of technologies starts off with sensitive radars.

This, again, is a technology that is relatively mature. It is one of the technologies that was extremely important and crucial, in World War II.

I have an observation that I sometimes make about trying to identify technologies, as we are doing today, with an example of pitfalls. Before World War II, the Department of War, as it was then, had a summer study to try to identify technologies. Our technology efforts were almost nonexistent in our services at that time. So they gathered together a group of college professors to identify technologies that would be important in World War II. They were very successful and identified every technology that was important, including jet engines. The only two they missed were radars, which saved Great Britain, and the nuclear weapon, which, of course, ended the war in Asia.

So, sensitive radars, in a sense, are an extension of a mature technology, but one which is very important.

We now have the capability of developing very high resolution radars, using very wide-bandwidth transmitters, which will give us a range resolution sufficient to identify targets and perhaps even to identify and detect targets which have low observable technologies applied to them. This could be laser technology as well as microwave technology.

The developments of weapons against radars have been proceeding apace. It is entirely possible that in a battlefield of the future, sensors or platforms that emit signals will not survive long in a high technology battlefront.

So passive sensors are very important in order to be able to supply information that is supplied by radars but which would not always be available. We will be working here with the infrared, visible, ultraviolet, X-rays, and microwave radiation portions of the spectrum. We will be achieving better resolution and, with respect to microwave radiometry, good performance in weather when optical sensors cannot perform well.

The next technology is automatic target recognition. This is a slight departure from our list of specific technologies because this is really an application-based technology, but one that is essential to the ultimate application of what we are trying to develop for our future weapons systems—very smart weapons, terminal submunitions, which can be self-guided to the targets, which can overcome the numerical advantage of the enemy by delivering weapons with kill potentials approaching a factor of one.

These can be distributed by our delivery systems in clusters, so that one delivery system can kill many targets on the battlefield of the future. In order to do that, however, we must be able to identify targets on the battlefield.

What we would like to do eventually is to identify targets regardless of what efforts the enemy may make to hide them, for example, to hide tanks along tree lines and roads, a capability that we do not have today, which we would like to develop. It is questionable in my mind whether we will develop it with the technology that we have today or whether we must develop a completely new type of technology for that mission. But we certainly will be able to use this technology to assist operators in tanks and aircraft to identify targets and to aim the weapons at the targets.

Phased arrays are a very important technology, which goes across the complete spectrum of radiation. Not only radars, but acoustic phased arrays and optical phased arrays will be very important in the future.

It will be possible, using this technology, for example, to develop what some people call "smart skins." Take aircraft antenna. For example, you are undoubtedly familiar with the current AWACS aircraft, which has a large antenna sitting above the fuselage. It may be possible in the future to develop a covering for the fuselage of the aircraft that would replace that antenna. This has the advantage of greatly reducing the drag on the aircraft, also making it much more difficult to identify the aircraft for what it is. In some respects, it will be essential, if you wish to have antennas on aircraft that will not interfere with the stealthy characteristics of the aircraft.

Phased arrays are also very important because they make it possible to steer the radar beam very quickly. For example, if someone is attempting to jam a particular radar, it is possible to steer the antenna pattern in such a way as to greatly reduce the amount of energy that the jammer will put into the receiver system.

Senator BINGAMAN. Dr. Millburn, let me ask a question on phased arrays.

One of the issues, as you are well aware, that we are holding hearings on and debating these days relates to the FS-X arrangement with the Japanese. I believe that the testimony we received in a hearing on that subject last week was that the flowback of technology was important to us, particularly with regard to phased array radar capability.

I notice your report indicates here that the Japanese have fielded a phased array mortar locating radar, the MPQ-6, which is not, however, technologically equal to its comparable U.S. counterpart. The United States has had many years of practical experience in phased arrays and has a significant lead over the rest of the world.

Is that information inconsistent with the suggestion which has been made to us that we would derive a great deal of benefit from flowback of technology on phased array radars as part of that FS-X arrangement?

Dr. MILLBURN. Mr. Chairman, I am sorry that I do not really feel competent to comment on that. I have not been involved in detailed discussions of the transfer of technology between the Japanese and us in that particular area.

Senator BINGAMAN. All right. Go right ahead, please.

Dr. MILLBURN. I have already alluded to the fact that we are developing sensors to collect data at a much greater rate than we do today, and capabilities to transmit that information at a much greater rate. What we have to do now is tie it into the next critical technology, data fusion technology. We have to be able to take that technology, which will be coming in from many different sensors and many different forms, and combine it all together and display it to the battlefield commander, for example, or to the pilot, or to anyone else, who may use that information in a way that he can interpret it quickly, screen out all the data that is extraneous to the mission that he is performing, and use it very quickly, essentially in real time.

This battlefield management technology will have application to smart weapons, to terminal self-guided cluster weapons, and to space surveillance and other surveillance systems, which maintain surveillance over very large areas.

Signature control, which includes Stealth, is a very critical technology. It is one that is very much safeguarded. Most of the information is compartmented. What we are doing, however, is looking at this technology from the point of view of the physics and the basic applications of it, particularly with respect to the eventual application of trying to defeat enemy Stealth capabilities.

I think historically, it has been true that the Soviets, 5 to 10 years after we have fielded a given technology, will field their version of it. We have to be prepared for our defense systems, for example, to be able to handle stealthy targets.

This is a way of trying not only to increase the camouflage, concealment, and deception, but also to counter them.

I have already briefly mentioned computational fluid dynamics, which, from my point of view, is a very exciting technology, which is under development jointly by the Department of Defense and NASA, primarily for use in the national aerospace plane.

Our first applications of it very likely will be in trying to model the hypersonic flow above Mach 8, which is where our current wind tunnels, ground wind tunnels, have a limiting capability.

The national aerospace plane will fly at orbital speeds, close to Mach 20. This technology will have the capability of solving the fluid flow equations, the equations that govern the flow of fluid over objects, in three dimensions. We currently have the capability of doing this in two dimensions, but it is essential that we have it in three dimensions.

It is also essential, because of the national aerospace plane in particular, because we will be marrying the engine with the airframe. We must be able to solve the problem of the chemistry of the airflow through the engine and over the surface of the aircraft.

So, the gas equations and the ionization equations will have to be considered.

It also will be very important in the future for significant drag reductions in ships and submarines, and for quieting the submarine wakes and the wakes behind ships.

Another technology is air breathing propulsion. It is essential to many—to the national aerospace plane program, as well as to our future aircraft. We will be able, if we are successful, to deliver engines that will have two times the thrust-to-weight ratio of our current engines, that will conserve 50 percent of the fuel. This will result in much longer range for our aircraft, and the thrust-to-weight ratio will mean that, in the future, we will have an aircraft with the capabilities of the current F-15, for example, and with vertical-short-takeoff-and-landing capabilities added. It is very essential to the changing threat that we perceive and the need for us to get into areas of the world where we won't have air bases or landing fields capable of handling aircraft like the F-15.

I think that the commercial applications are also evident, which will give us a chance, again, to extend our lead in commercial aviation.

Air breathing propulsion is a mature technology, but we will be able to make a significant improvement in it by putting some emphasis on this technology. As I said, the capabilities of our jet engines have increased over the years because of steady, slow improvements in the technology, not in dramatic fashion. We are trying to do so with this thrust and this critical technology.

TECHNOLOGY OBJECTIVES (CON'T)

HIGH POWER MICROWAVES: Microwave radiation at high power levels for weapon applications.

PULSED POWER: Generation of power with light-weight, low-volume devices.

HYPERVELOCITY PROJECTILES: Generation and use of hypervelocity projectiles to penetrate hardened targets.

HIGH TEMPERATURE/HIGH STRENGTH/LIGHT-WEIGHT COMPOSITE MATERIALS: For aerospace and other applications.

SUPERCONDUCTIVITY: Fabrication and exploitation of superconducting materials.

BIOTECHNOLOGY: Systematic application biology in military engineering or medicine.

High powered microwaves is the next critical technology. This is one that we are developing jointly with the Department of Energy. The capability resides very much in the national laboratories at Livermore, Los Alamos, and Sandia. They are working very closely with us.

Our primary concern here is the survivability of many of our very highly capable electronic systems. High powered microwaves produce radiation effects, which, in some respects, are similar to that produced by radiation from nuclear weapons at high altitudes, and so, we are interested in seeing how these might affect the survivability of some of our weapon systems and some of our data systems in the field.

Since some of our systems are susceptible to such damage, we also want to examine whether we can apply this technology to damage systems that the enemy may field.

Pulsed power is a technology which is specifically aimed at directed energy weapons and anti-armor weapons. It is also very important for high powered microwave weapons and electromagnetic guns.

The main thrust here is to improve the energy density storage capability of capacitors by an order of magnitude or more.

The next technology, hypervelocity projectiles, is, again, similar to the one on automatic target recognition in that it is more of an application technology than a basic technology.

Again, this is in response to the problem we have with trying to defeat advanced armors on the battlefield, but also is very important for electromagnetic guns, where we will be able, perhaps, to develop the capability of a 9-megajoule rail gun, which will be very essential to understand how we can penetrate hardened targets in the future.

The next technology, again, is essentially a process technology. Materials are well understood in many respects. The problem in trying to apply polymatrix composites, metal matrix composites, ceramic matrix composites, and other types of advanced materials is how do we manufacture them in a way that we can reproduce them reliably and at a cost that we can afford.

This has a further application, again, to the national aerospace plane. In order to develop the capability, the technology, to take us from ground to orbit with a reusable, single stage vehicle, we will need new materials. We will need materials that will be able not only to survive the heat environment, but also will provide the strength required to carry the engines and the payload up into orbit.

A followup on this type of development, this type of materials technology, is the increasing dependence on foreign supplies. We can in some cases supplant titanium and other types of metals where we do not have domestic sources or reliable foreign sources with materials that we have developed in their place.

The next two, superconductivity and biotechnology, are examples of what I would call enabling technologies. They are technologies that are emerging from the sciences but have not yet been applied in a meaningful way to applications. Exactly how we will apply these I think is still to be determined.

In superconductivity, of course, the emphasis is currently on high-temperature superconductivity. I would like to say that it is also important not to ignore low-temperature superconductivity. High-energy particle physicists have been using liquid hydrogen for years. They have developed a technology where it is quite sensible to envision using low-temperature superconductivity, and certainly while we try to develop the capabilities of high-temperature superconductivity, we can do much of the basic work in architectures—how do we actually apply superconductors to real problems in the real world.

In our high-temperature work, we will be focusing on understanding the physics of high-temperature superconductivity and developing materials which will extend the regime in which we can apply it.

Future applications, of course, include such things as electric-drive systems for ships, generators, energy storage, which currently is under development by the SDI office, and very high speed computers.

This is an example of a case where one laboratory essentially was working on developing the capability of applying superconductivity to very high speed computers, and that was IBM. They were unsuccessful in their approach. The rest of the people in our side of the world gave up on it, but the Japanese continued working on it and used a slightly different approach. They appear to be achieving success in their approach to that.

It illustrates the desirability, in fact, from my point of view, the requirement, to have more than one laboratory working on some technology that we think is critical, so that different approaches can be taken, so that in case one approach proves to be a dead end, we do not give up on the technology prematurely.

Biotechnology, in my view, is similar today in terms of application, to nuclear and atomic technologies before World War II. In 1925 we saw the development of quantum mechanics, which explained the structure of the atom and gave us the leads that we needed to understand atomic physics and, later, nuclear physics.

The same is true today in biology. The understanding of the double helix structure of DNA and RDA is very important. Most of the applications of biotechnology are in medicine and we have largely omitted that from our list. But developing vaccines to protect troops is very important, particularly if you have to go into areas of the world where few of our citizens live, and so they are now immune to the diseases there. So for chemical and biological weapons, we particularly need sensors to warn if any of our troops are under attack by chemical or biological weapons and the nature of those weapons. Responses to attacks by chemical or biological agents are quite different, depending on the types. Also, we may not know specifically what the agents are before they are actually used.

The inverse is also true. This technology could be used by other countries or other individuals to develop chemical and biological agents very quickly in ways that we would not be aware of until they already were developed and essentially fielded.

What we wish to do is to expand this use of biotechnology to genetic engineering, applying the same engineering principles as we use to apply atomic physics or nuclear physics. One of the first ways we might do this is in waste disposal. Already, there are people working at developing biological agents that will dissolve toxic waste. The idea is to develop bacteria that feed on some of these toxic materials and convert them to materials which are nontoxic. When they have finally converted all of the toxic materials, they run out of their food source and they die without leaving any environmental hazard behind them.

If we can do that, that will greatly—and I stress the word "greatly"—decrease the costs of some of our waste disposal cleanup problems. Of course, the Department of Defense has a major problem in that area and one where we certainly would like to see the costs decrease by a factor of 10 or 100.

It is also quite possible in the future, if you want to dream a little bit, to apply this genetic engineering to things like biosensors, bioprocessing memories. We are carrying around in our heads the best biocomputer that has ever been invented. If we can apply just one-tenth the technology, only one-tenth the capabilities of our brain, we will have computers that are vastly more capable than what we have today, and memory banks also which would put to shame anything that we currently envision doing.

PRODUCTS AND PROCESSES

Applications to Products and Processes / Critical Technologies	Weapons					Platforms				Information Systems						Support							
	Smart Weapons	Ballistic Missiles	BMD/ASAT	Electronic Combat	Electromag Weapons	Tanks/Ground Vehicles	Submarines/Ships	Aircraft	Spacecraft	Search & Surveillance	Reconnaissance	Battle Mgmt/C3	Non-Cooperative ID	Guidance & Control	Arms Control	Design & Integration	Manufacturing	Maintenance/Logistics	Test & Evaluation	Training	CBD	Medical	Combat Environment
Microelectronic Circuits and Their Fabrication	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Preparation of GaAs and Other Compound Semi-Conductors	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Software Producibility	X	X	X	X						X	X	X	X	X	X	X	X		X	X	X		X
Parallel Computer Architectures		X	X	X						X	X	X	X		X			X	X			X	X
Machine Intelligence/ Robotics	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X
Simulation and Modeling	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Integrated Optics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Fiber Optics						X	X	X	X	X	X	X				X	X	X					
Sensitive Radars	X		X	X	X					X	X		X		X	X	X				X	X	X
Passive Sensors	X	X	X	X		X	X	X		X	X		X	X	X	X	X	X			X	X	X
Automatic Target Recognition	X	X	X							X	X	X	X	X	X	X							X
Phased Arrays	X	X	X	X						X	X	X	X		X	X	X						
Data Fusion	X		X	X		X	X	X	X	X	X	X	X	X	X	X			X	X			X
Signature Control				X		X	X	X	X	X	X	X	X			X							X
Computational Fluid Dynamics						X	X	X	X							X			X				
Air Breathing Propulsion	X		X			X		X								X	X						
High Power Microwaves					X					X	X	X				X	X						
Pulsed Power			X		X	X	X	X	X														
Hypervelocity Projectiles			X		X																		
High-Temp/High-Strength/ Light-Weight Composite Materials	X	X	X	X	X	X	X	X	X							X	X	X					
Superconductivity	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Biotechnology Materials and Processing																X	X				X	X	

The next chart, very briefly—and I do not expect you to be able to see it, really—just illustrates that we are concerned both with products and processes. It is reproduced in the report, and it is on page 8 of the report.

There are "x's" essentially in every column. Again, you will see the dearth of "x's" for biotechnology materials and processing, illustrating that it is a very young and junior technology.

COMPARISON WITH N.I.C.'s

Critical Technologies	Country
Microelectronics Circuits and Their Fabrication	India, S. Korea, Taiwan
Preparation of GaAs and Other Compound Semi-Conductors	China (for microwave applications)
Software Producibility	Brazil, India, Israel, Sweden
Parallel Computer Architectures	
Machine Intelligence/Robotics	Switzerland
Simulation and Modeling	
Integrated Optics	
Fiber Optics	Brazil, China, Indonesia, S. Korea, Taiwan
Sensitive Radars	China, Israel
Passive Sensors	Israel
Automatic Target Recognition	Israel
Phased Arrays	Israel
Data Fusion	
Signature Control	China, Israel, Sweden, Switzerland, Taiwan
Computational Fluid Dynamics	China, Taiwan
Air Breathing Propulsion	China, India, Israel, Sweden, Taiwan
High Power Microwaves	China
Pulsed Power	China, Israel
Hypervelocity Projectiles	China, Israel, Sweden
High-Temperature/High-Strength/ Light-Weight Composite Materials	Australia, Brazil, China, India, Israel, Sweden, S. Korea, Switzerland, Taiwan
Superconductivity	China, Switzerland
Biotechnology Materials and Processing	Many Countries

We were asked to compare what other countries are doing. The comparison with the Soviet Union and with some of the other nations in the world will be reserved for the classified annex to the report, which we will deliver to you next month.

This is just a comparison for the newly industrialized countries, the so-called "NICs." We went through and made an estimate of those countries which have significant capabilities in each of the 22 technologies that we identified.

This should give us an opportunity to identify areas where we can engage in cooperative research with these countries. There is one that I think there is also a danger in, and that is a danger to our commercial and our economic posture with the rest of the world—biotechnology. It is an area, a technology, that we are just beginning to develop. The capital investment in the Western countries, the developed nations, is not very large yet. There is an opportunity there for these developing countries to compete with us without having to put up a great deal of capital investment, to build the infrastructure required to compete with us in this area. So we have to be certain that we do pay attention to this technology, to develop the capital investment and the capability in this country, or we may find that we are going to be competing adversely with nations, such as Brazil, that are currently putting a great effort into developing biotechnology capabilities.

SUMMARY:

PLANNING FOR THE FUTURE

o STRATEGIC PLANNING ...

... TAKES ALL TECHNOLOGIES INTO ACCOUNT

o CRITICAL TECHNOLOGIES ARE THE STAR PERFORMERS ...

... BUT THE TEAM IS ALL-IMPORTANT

o STEADY PROGRESS ...

... COMPOUNDS YEARLY IMPROVEMENTS

o STABILITY IN FUNDING AND PERSEVERANCE ...

... PAY OFF, whereas

o UNCERTAINTY IN FUNDING ...

... IS DETRIMENTAL TO PROGRESS

That completes my overview. I just want to end up by saying that in our strategic planning, we do not focus only on the critical technologies. We must consider the whole technical infrastructure for what we are trying to do. These critical technologies can be considered the quarterbacks, or the stars, of the team. But you cannot have a football team or any other team unless you have all the other members blocking, tackling, and doing all the things that are so important.

We have identified those things that we think will have dramatic improvements in capabilities, but I do not think we can ignore the compounding effect that Einstein called the eighth wonder of the world—compound interest. Compounding improvements in mature technologies over the years pay off greatly.

Also, stability in funding of our research programs is essential. There is nothing more detrimental, more harmful, to trying to develop a capable research effort than to have uncertainty in what your funding will be for the following years.

Thank you, Mr. Chairman.

Senator BINGAMAN. Thank you very much.

I have several questions.

Mr. Lohr, I am not certain if you are the right person to address these to, or Dr. Millburn, or Mr. Du Val.

My first question is on how well we are organized to manage the development of these technologies within the Federal Government. Do we have a clear notion of who is responsible for the development of each technology? Do we have a mechanism for coordinating the development and research that goes into each?

Mr. LOHR. Let me start from an overall standpoint.

The research that goes on within each of the services is managed by the Assistant Secretary of Research and Development for that specific service. He basically has that responsibility.

He has the laboratories that report to him, and he conducts reviews within that service. Those programs and projects that are going on with each of these 20 technologies could be many, many projects. For example, there could be one line item called "propulsion," and we could have 10 or 20 different projects going on within that one item.

As they come together, they report up through to OSD, and Dr. Millburn's office, is then responsible for coordinating those activities.

I will let him describe how the reviews are conducted during the year, both within the services and across, to give you an idea as to how they are managed and how their responsibilities flow.

George, would you do that?

Dr. MILLBURN. Yes, I would be very happy to.

We have essentially three levels of review. Let me start with the most detailed, which we do not do on an annual basis. Occasionally, we will have what we call a topical review, which involves all three services, all the defense agencies that are working in a given technology area, a given part of a technology area. This can take a week of intensive discussion in great detail of what is going on in each of the services, each of the agencies, in developing a given technology.

This is done, and we are planning to do that, for example, this year in the software area. I am not comfortable with the program that we have developed in software, and I want to establish exactly what it is and then determine what to do next to strengthen it if it needs strengthening, which I am certain it does.

The next level review is a review that we do annually, which is carried on by the staff specialists in my office. I have approximately 12 or 13 staff specialists, who consider different technology areas. They meet with their counterparts in the services and with the defense agencies each year for a general review of the programs and what is going on, the state of development, programs that are developing, those which are running into trouble and which may be candidates for termination, those which are proving to be more effective than we expected and where we should perhaps increase the funding or make provisions in the near future to increase the funding.

Finally, there is what I call our investment strategy review, which is a top level review, which involves all three services and defense agencies, and the senior people within those services and agencies that are responsible for these programs.

We have always held these reviews. I have been in the Pentagon now for a little over 10 years, and we have held them every year recently and certainly for years before then. The thing that we started doing differently last year, which was based upon my discussion with the senior military people who are responsible for the science and technology program, was to give them feedback. Now, an essential part of our investment strategy review is not only the presentation of material by the services, but the staff of the Office of the Secretary of Defense stands up and tells the services what we heard them tell us during our staff specialist reviews. They compare that with what they think they told us.

It turns out, as is often the case in communications between individuals, that it sometimes is not identical.

That is an essential part of it.

We have formed an executive committee of the senior people in the services, and myself, and we meet on a regular basis, approximately every 6 weeks, to review how we are doing with our investment strategy. On the chart that I showed you that you saw the little box named "defense guidance." I want to be certain that when that defense guidance comes out the services know what to expect, that it is not a surprise, so that they can be developing their programs in anticipation of what the Secretary will be telling them to do.

Senator **BINGAMAN**. A follow-on question is whether there is one person in one agency who is designated as the lead person on a particular technology development.

For example, let us take integrated optics. If, in fact, you become dissatisfied, concerned, or interested in the status of progress in that area, is there a single person you can call in and hold accountable for monitoring that technology for you?

Dr. **MILLBURN**. At my level, I would probably call in the senior individual on my executive committee from the service in which the concern originated and discuss with him what was going on.

Most often would be the case that all three services have programs in that area. So we would also discuss it jointly.

In some cases, we may have identified a lead service to take the responsibility. That is not done typically at this level in the technology base program, where we are still trying to develop the technology. That is more commonly done when we get to applications, which are in the 6.3(a) portion of the advanced technology demonstration programs.

Is there some one individual responsible for integrated optics? I think in the sense that you are asking the question, there is not. It would be extremely difficult to try to identify a single individual and say that you are the person responsible for all integrated optics activities in the Department of Defense. The details of what we are trying to develop will determine where that work is carried out.

The majority of our work is contracted out to industry and is done by individual companies around the country. It is a question of monitoring the progress of that work carefully, which I think we do in a very effective way, and comparing that with work which is done in-house, in the in-house laboratories of the Department, and in some of the not-for-profits that we use.

Senator BINGAMAN. What about the coordination of your research activities within the Department of Defense with other Federal agencies that may be pursuing research in the same area? You have indicated in some of the specific technologies that there is good work going on in NASA or in the Department of Energy laboratories.

I gather some of the civilian agencies, such as NSF, also get involved.

To what extent is there coordination between the agencies? When you have topical reviews, and to sit down with, say, software and decide where you are and where you need to go, is there any effort to involve anybody besides DOD?

Dr. MILLBURN. The responsibility for coordinating the DOD efforts in the technology areas with other agencies does fall on my shoulders. I am the person in the Department responsible for that coordination.

I do it through a variety of committees, some of which I personally attend and some of which are attended by staff specialists. It depends on the makeup of the committee. If it is getting into details on engine development, for example, where we would be working primarily with NASA, then I would have the person in my office who is most familiar with that technology attend those meetings and discuss the efforts.

We also have meetings that are at a higher level, which I do attend personally, where we get into the main thrusts of what we are doing in the technology areas. Right now, in the last year, these have been, to a certain extent, concerned with a very major problem facing the country, which is an adequate supply of scientists and engineers. I am very active personally in trying to cooperate with other agencies to see that we work in a coordinated fashion to develop efforts to increase and achieve a reliable supply of scientists and engineers in the future.

Senator BINGAMAN. The specific question, with integrated optics, as a particular subject, is whether there is a mechanism by which the appropriate people in the Department of Defense can sit down with the appropriate people in other Federal agencies pursuing development of that same technology, and compare notes and coordinate projects?

Dr. MILLBURN. Yes. We do that in a variety of ways.

We have joint technical coordinating groups which meet, depending upon the technology. We also work very closely with the professional associations. In integrated optics, for example, it is very likely that the Institute of Electrical and Electronics Engineers would have a panel working in that area. We would be working closely with them, attending the meetings and participating in those discussions to be certain that we are aware of what is going on in areas that are not part of the Department of Defense and perhaps not part of the Government, but where the development is very important to us.

In the Government itself, we do have other committees that we attend. In integrated optics, it is probably not one that we would exploit as well as we would engine technology, for example, with NASA, or high powered microwaves, with the Department of Energy, or munitions capabilities in the Department of Energy laboratories. There we work very closely and do meet on a regular basis with our counterparts in those laboratories.

As far as a specific person is concerned, I have identified a staff specialist in each area with a responsibility for maintaining cognizance over that area, not only in the Department of Defense, but across the Government, and, to the maximum extent possible, across the whole field not only in this country, but as it develops around the world.

So, in that sense, there is an individual, but his responsibility is limited because his authority is limited. Our authority is one of guidance and oversight. We do not have the authority to direct what is to be done, only to suggest that it be done. The direction will have to come from either the Under Secretary for Acquisition or the Secretary of Defense. Usually, that is not necessary. If we discuss things at the level I described, that is usually sufficient to get any action necessary.

Senator BINGAMAN. Is there any effort by the White House Science Advisor, or anybody else in the executive branch, to accomplish the coordination of our research activity across Defense and civilian agencies?

Dr. MILLBURN. Very much so. It depends in part on the national visibility of the programs. A program as visible as the national aerospace program, for example, is done very well and very carefully. Something like integrated optics, again, which is somewhat farther from applications, it is done in a less visible way, but certainly is still done.

We do have a Federal Coordinating Committee on Science and Engineering Technology, of which I am the DOD member, that meets periodically to discuss this type of thing.

Senator BINGAMAN. Are the milestones that you list for some of the technologies in the nature of goals that you intend to work toward? Maybe you could elaborate a little bit on what credence you think we can give to these milestones and how those were arrived at.

Dr. MILLBURN. Those were arrived at by discussing the specific programs we have underway with the service people or the agency people who are responsible for performing them. We have fairly arbitrarily divided the milestones into three periods: 1990, 1995, and the year 2000. The ones for 1990 I think you can have great confidence in, and, of course, the confidence of actually achieving it will diminish as we go out to the year 2000. By the year 2000, those are our objectives or goals, what we would like to accomplish and what we think we have a reasonable chance of accomplishing. But they are not necessarily what we really will accomplish.

We would not necessarily terminate a program if we saw that we were not going to be able to meet the established milestones for the year 2000. But we may well decide to, in our long-term planning, keep in mind that we should not pursue that program beyond a certain level of achievement.

Senator **Bingaman**. As we go forward in the next 5 years, one of the issues that obviously is going to be a concern to all of us is whether we are, in fact, moving ahead as rapidly as other nations in the development of some of these technologies.

We have some very general statements in here as to where some other countries are and where we are relative to other countries. But I do not see anything very specific that we would be able to look to.

If you submit this same report next year, or 3 years from now, will it be possible for us to know whether whatever lead we may have had in 1989 has continued or is eroding? I notice in the statement that I quoted from John Deutsch in my opening comments, that he feels that our technological advantage has eroded significantly in recent years. If someone makes that statement 5 years from now, are we going to be able to confirm it or contradict it based on this report?

Or should we add some information to this report which would allow us to confirm or contradict such a statement?

Mr. **Lohr**. Mr. Chairman, let me take a first pass at that. It is an excellent question.

Part of the problem that we have is not having enough effort going on in critical areas where, if one approach fails, we have some other work going on, so that we don't start all over again. We worry about the time problem. We'll get there quicker if we can fund more programs, if you have a number of people doing research in a certain area. But when you get to the question of how do we score or how well we are doing, it seems to me the bottom line is how are we putting to use the technology that somebody in the laboratory has developed and provided to some other group to put it into some system.

So, what that gets down to is how well are we doing in transitioning technology, as it reaches some point of maturity, where we can start putting it together with other technologies and putting it into a specific system.

I think we need to do a better job of doing that.

So, on the next report, we need to take these key technologies and track what comes out and how they evolve into a usable system. This, it seems to me, would provide one mechanism for evaluating how well we are doing.

Senator **Bingaman**. I agree with your comment because, obviously, unless we can apply these technologies to an actual product that is usable, we are not doing ourselves much good by just pursuing research.

But my question remains whether, at the research level or at the developmental level, do we need additional information in order to score our relative progress, as compared to our allies, or the Soviets, or others in the world? If we have a hearing 3 years from now and someone says that we have fallen behind significantly, or that we have lost much of the lead we had 3 years previous in the development of integrated optics, is there information in this report that would help us judge that statement?

Mr. LOHR. It might be possible to take each of these technologies, draw a line in the sand and ask where we stand today, what can we do in the way of microelectronics, what can we do in the way of parallel processors and define in some quantitative way where we are with respect to the use of knowledge based on artificial intelligence in automatic target recognition systems, and then attempt to do the same thing say a year from now and see how they compare.

George, do you have anything to add?

Dr. MILLBURN. Yes.

Again, that is a very, very good question and is one that we will be considering over the next year. The reports that you have in front of you show that we actually began work with our working group in December. It essentially is the result of 3 months of work and not 12 months of work. The next report will be the result of experience we have gained in putting this one together and the strengthening that will come from integrating it more explicitly in our planning processes.

In putting this report together, we obviously had to make decisions on priorities, where we are going to put our efforts. Our comparison with other countries is not as comprehensive a survey as we will do in the future. The comparisons we have are based on the best information we could collect over that period of time with limited involvement by people, both within the Department of Defense and other Government agencies who have a great deal more information.

I think you will find that next year, we will be much more thorough in our discussion of the relative standing of U.S. capabilities in these areas and foreign capabilities.

I might add, in terms of where we will stand vis-a-vis our technical capabilities versus the world's, it is to be expected that there will be a gradual levelling of capabilities. I doubt very much that the United States will ever be in a position again—I could almost say that I hope we will never be in the position again—that we were after World War II, where we were the only Western country in the world, maybe the only country in the world, with the capability of devoting as much time and effort to technologies as we did. Over the years, we, of course, became the leader in almost every technology of any importance.

I can remember the 1930s, when we were the people who took the output from Europe and applied it and made very significant applications of those technologies that were developed off our shores.

I think it is important that we maintain our lead in technologies that are essential, both to our military and our economic well-being, and that is the purpose of this effort. We will be integrating that well into our planning processes, and I think we will be able to maintain if not a lead, then at least a parity, in any technology that is important to us.

Senator BINGAMAN. With regard to the technologies that you have just alluded to, that there are technologies essential to our economic well-being which may not be on this list because they do not directly impact on our security in the sense that you have defined it, do you know of any effort to pull together a combined list that would cover both the technologies essential to our national security and the technologies essential to our economic future? Is that done any place in the Federal Government, to the best of your knowledge?

Dr. MILLBURN. Not to mine, Mr. Chairman.

Mr. LOHR. I do not believe so.

We have had many discussions about the industrial base and the competitiveness of U.S. industry, and this question comes up, as you would expect, many times. But as part of the Department of Defense, we consider those and believe that a healthy industry helps the Defense Department as well.

But I am not aware of anyone who has done a rigorous compilation of the list that you are talking about.

Senator BINGAMAN. Okay.

Within the Department of Defense itself, there are quite a few listings that we have run across over the last several years. In 1981, the Defense Science Board came out with a list called "Technologies That Could Make a Big Difference". They listed 17.

In the private sector, the U.S. Aerospace Industries Association came out with a list of key technologies from their point of view. There is another list that the Air Force came out with a couple of years ago.

To your knowledge, at least in the Department of Defense, do you now have consensus? What if I were to hold a hearing in a few weeks and call in the Air Force to see if they would agree with this list? Is there agreement, as far as you know?

Dr. MILLBURN. As far as I know, there is. The Air Force was represented on all the working groups. It has been reviewed.

We had a meeting of what we call our Science and Technology Committee of the Defense Acquisition Board last Monday, and this was reviewed. I had the members of the executive committee of our investment strategy planning procedure present. There was no objection to any of these technologies.

I have to say, if I held a similar position in the Navy and you asked them to put together a list of critical technologies, you would probably see more things connected with undersea warfare and the like, which is very important and special to the Navy.

If you asked the Air Force, you might see things that are slanted more toward air capability. With the Army, we have plenty of antiarmor capabilities, as I pointed out, but there would certainly be a different viewpoint.

But there is agreement within the Department on these 22 technologies. That is not to say that there is unanimous agreement. In fact, personally, if I were to make up a list of 22 technologies, I might come up with a different list. But this was done in a way as to solicit the opinions, comments, and inputs from across the board, and I think it was done very, very well.

Senator BINGAMAN. Mr. Du Val, is it your view that outside the areas that were excluded from this list, the nuclear area in particular, there is agreement within the Department of Energy that these are the 22 most critical areas in which we need to make progress?

Mr. DU VAL. I think, Mr. Chairman, within the DOE Office of Defense Programs it is our best judgment that the focus should probably be on these top 20 or 22.

To go beyond Defense programs would involve others that had not had an opportunity to be involved in this, and that might change the mix somewhat. Each would have their own list.

Senator BINGAMAN. On funding, I notice in reading through here that with many of the technologies where you list the level of funding you indicate that SDI funding is crucial.

SDI is a part of the budget that, at least in the last several years, has been significantly cut by the Congress. And when those cuts occur, technology developments such as those you have listed here tend to be cut disproportionately more than other parts of the SDI budget.

Gallium arsenide is one example where a significant amount was requested. Once we finished cutting the budget and SDIO finished cutting the budget, there was not nearly the funding in there that was anticipated.

Should we, the Congress, do something about moving the development of these technologies and the funding for them out of the SDI budget, and putting it in other places in the research effort?

Dr. MILLBURN. That is a question that I can only answer on saying that I support the budget submitted by the President. [Laughter.]

Senator BINGAMAN. I guess all of you are constrained to answer that way.

We will pursue that thought, or at least continue to ask people about it in the next month or two, as we go through our markup. I do think if these areas are, in fact, critical to national security, that perhaps we need to make some special provision to see that they are adequately funded.

I understand that you cannot always make progress just by throwing additional money at a particular research activity. But if you starve an area of research, you can certainly impede your progress. We want to try to avoid that.

On the question of progress by our allies and progress by other countries in these activities, do we have the information we need? I know that much of that will be covered in your classified report. But do we have the information that we need, and the information gathering capability that we need, to adequately assess not only progress that our allies and others are making in these technologies, but research and work that allies are doing and that other countries are doing that we may not think are on the critical list, but that other countries do?

Dr. MILLBURN. I think that is an area where there are mixed capabilities.

With respect to the Soviets, we have a very good idea of what they are doing in areas that we can easily see. In an area like integrated optics, where the technology is not at the point where it would be visible to the types of things we can see easily, you may not know that well.

Obviously, if it is a brand new technology and we do not have a significant effort, and we would not be looking for it, we might miss it. But with our allies and with other friends and other nations around the world which are more open and where we have greater access, we will be working very closely with the office within the Department of Defense, the Industrial and International Program Office, to get a much better approach to this information.

I had a meeting with Mr. McCormack, who is the Deputy Under Secretary for that office, and with Mr. Norm Augustine, who is chairman of the DPAC, the advisory group to the Secretary, to discuss getting the industry people involved and trying to give us information. The industry people are the ones who go out and talk to our counterparts around the world on a much more detailed basis than we do.

We also will be alerting our defense attaches in various countries to be alert to these particular technologies and to be alert of any information they can gather and send to us.

So we'll have a more organized collection process in being for the future. I think a year from now I can give you a better answer as to how effective that is.

Senator BINGAMAN. We can go into this when we receive the classified version of the report. Has the intelligence community been significantly involved in helping to prepare the classified version of the report?

Dr. MILLBURN. Yes.

Mr. LOHR. Mr. Chairman, I would like to add a comment to the one George just made.

Last fall, prior to the Four Power and the CNAD meeting, we had assembled the Military Attaches of the Offices of Defense Cooperation (ODCs) from the embassies in Europe, and discussed the need for working with industry and working from our list of needs, to see if they could provide some assistance in uncovering areas where we could use some of the technology that is being developed by our allies.

To this extent, we have given them the list that the plan articulates, and that is going out to all the ODCs for their reference. We will be using that as a way of finding some cooperative development efforts that we should get into where our allies might be a little farther downstream than we are.

Senator BINGAMAN. All right.

I think this is a very good first effort, and I am very impressed with the effort that has gone into it.

Let me once again thank all of you. We will undoubtedly have some additional questions when we see the classified version of the report and perhaps we will have another hearing at that time. We will judge then whether it is appropriate.

I appreciate it very much.

We will conclude this hearing.

[NOTE: The Department of Defense Critical Technologies Plan (dated March 15, 1989) is retained in committee files.]

[Whereupon, at 11:10 a.m., the subcommittee adjourned, to reconvene upon the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

THURSDAY, MAY 11, 1989

U.S. SENATE,
SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

ACQUISITION POLICY AGENDA

The subcommittee met, pursuant to notice, at 1:34 p.m., in room SR-222, Russell Senate Office Building, Senator Jeff Bingaman (chairman of the subcommittee) presiding.

Committee members present: Senators Wallop and Coats.

Committee staff members present: Andrew S. Effron, general counsel; Geary Burton, counsel; Kathryn E. Bognovitz, special assistant.

Professional staff members present: John J. Hamre, William E. Hoehn, Jr., and William H. Smith.

Minority staff members present: Jonathan L. Etherton, professional staff member.

Staff assistants present: Elizabeth Ann Harlow, Lori M. Jackson, and Cindy Pearson.

Committee members' assistants present: Lisa Davis, assistant to Senator Bingaman; Jack D. Crouch II, assistant to Senator Wallop; Charles Pearcy, assistant to Senator Lott; and Eric H. Thoemmes, assistant to Senator Coats.

OPENING STATEMENT OF SENATOR JEFF BINGAMAN, CHAIRMAN

Senator BINGAMAN. We will go ahead and start the hearing. I understand Senator Wallop is on his way and he may have a statement when he comes in, but I will make a short statement and then call on our witnesses.

The subcommittee meets this afternoon to receive testimony from the General Accounting Office and the DOD Inspector General on recommendations for an acquisition policy agenda. There is growing concern that the acquisition system cannot fulfill its fundamental purpose, which is, of course, to provide our men and women in uniform with quality equipment and services on time and within budget.

In 1986 the Packard Commission described the system as fundamentally ill. In the last year, the unfolding "Ill Wind scandal" has demonstrated that the patient is not getting better. The symptoms are easily identified: overruns, delays, defective products, fraud, and difficulties in attracting and retaining quality people. The cure, however, will require diligent and cooperative effort on the part of the executive branch and Congress to develop remedies that improve rather than exacerbate problems in the system. The Packard Commission provided broad guidance on how to address these problems, but the difficult task of implementation remains largely incomplete.

During the last Congress this subcommittee received testimony from government, industry, and academic witnesses who stressed as a common theme the importance of reducing the volume and complexity of acquisition laws and regulations and minimizing the duplication of oversight activities. We found that the Department had neither established criteria or procedures for a systematic evaluation of its regulatory simplification programs, nor had it responded to the encouragement of the Armed Services Committee in 1987 to submit significant legislative proposals to reduce the complexity of the acquisition system.

In addition, we learned that the Department had not undertaken a serious effort to eliminate duplicative oversight activities. As a result of our concerns, we included a provision in last year's authorization bill requiring the Under Secretary of Defense to submit a report to Congress on simplification of procedures governing this acquisition system. The Under Secretary prepared a report in December of 1988 and I will include that in the record at this point.

[The report referred to follows:]

THE UNDER SECRETARY OF DEFENSE
WASHINGTON, DC 20301

ACQUISITION

EC0304

20 DEC 1988

Honorable George Bush
President of the Senate
Washington, DC 20510-0010

Dear Mr. President:

I am pleased to report to you on actions taken by the Department of Defense (DoD) to simplify and streamline our acquisition procedures.

Section 809 of the National Defense Authorization Act of FY 1989 and Conference Report 100-989 require the Under Secretary of Defense for Acquisition to report to Congress on current programs to simplify DoD acquisition procedures. Specifically, we are required to analyze our simplification programs, regulations, and existing laws, and to describe the results of the joint study undertaken by the Under Secretary, the DoD Inspector General, and the Comptroller to prevent duplicative audit and oversight reviews of DoD contractors.

Our enclosed report includes a discussion of the feasibility and desirability of structuring oversight based on risk assessment; granting authority to a senior DoD official to resolve complaints regarding duplicative oversight activities; establishing formal independent means to ensure quality, integrity, and professionalism in performance of audit and oversight functions, and establishing policy to prohibit duplicative reviews of contractor activities.

The DoD is committed to simplifying the acquisition process and reducing duplicative and excessive oversight activities. The legislative issues that have complicated the acquisition process are addressed in the enclosed report. We are developing an additional legislative package that will be submitted in the near future. We will continue to work on these initiatives until meaningful improvements are made.

An identical letter has been sent to the Speaker of the House of Representatives.

Sincerely,

Enclosure

THE DEPARTMENT OF DEFENSE

REPORT TO CONGRESS

ON

SIMPLIFICATION AND STREAMLINING

OF

ACQUISITION PROCEDURES

DECEMBER 1988

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SEC. 809 REPORT ON SIMPLIFICATION AND STREAMLINING OF ACQUISITION PROCEDURES

A. REPORT ON ACQUISITION SIMPLIFICATION PROGRAMS

The Under Secretary of Defense for Acquisition has initiated several programs to simplify the acquisition process and implement the Packard Commission Recommendations.

1. The Pilot Contracting Activities Program (PCAP) gave waiver authority to selected activities within the Military Services and Defense Agencies to test innovative contracting practices and recommendations for change in the acquisition process. The PCAP program is a bottom-up approach to identifying impediments in the acquisition process. There are 45 program participants, and recommendations have numbered some five hundred. The overall initiatives can be characterized as increasing contracting officer authority and streamlining the contracting process. Quarterly meetings are held to assess results and decide on proper implementation. Success of this program will be determined by proposed changes being selected for permanent implementation. The Pilot Contracting Activities Program is a continuing initiative.

2. The Bank Card Program is a simplified small purchase procedure for acquisitions under $25K. Bank Cards are "credit card" type methods of buying small dollar value items normally purchased through imprest fund or SF 44 transactions. Military Departments currently are testing the Bank Card Program and initial results show a reduction in acquisition lead time and administrative paperwork. Review of the test results will be accomplished in 6 months. Test activities are expected to expand within the year and the General Services Administration (GSA) with the Department of Defense (DoD) assistance is preparing a contract to place Bank Card requirements on GSA schedule for use by all Federal Agencies.

3. We have completed a study of nearly 500 different regulatory requirements tied to dollar thresholds identified by the Packard Commission and DoD as potential areas for streamlining the Federal Acquisition Regulations (FAR) and the DoD FAR Supplement (DFARS). Phase I of the study evaluated 88 dollar threshold requirements of which 72 were administratively imposed. The study recommended that 42 remain unchanged, that 15 be eliminated entirely, that 8 be retained but increased, and that, in 7 cases the threshold should be removed and replaced with guidelines. The Defense Acquisition

Regulatory Council is considering these recommendations for appropriate action.

4. Phase II of the study reviewed the remaining 366 thresholds of which 277 were administratively imposed. It recommended that 42 threshold values be increased, 74 eliminated, 7 studied further, and 154 remain unchanged. The number of different thresholds is significant and affects both the DFARS for which DoD has sole responsibility and other regulations which are under the cognizance of the Civilian Agency Acquisition Council. DoD is committed to evaluating recommendations affecting regulations under its cognizance and taking the action to implement needed changes.

5. An electronic publishing system was purchased giving DoD an on-line edit capability of the FAR and DFARS. Efforts are currently underway to complete the acquisition of advanced software that ultimately will enable the FAR and DFARS to be virtually a desk top publishing system. This effort will increase DoD's capability to make needed changes and disseminate them to the acquisition community more quickly and efficiently. The FAR and DFARS data base will require extensive effort to convert to the electronic system.

6. The Services and Defense Logistics Agency completed a line-by-line review of their supplements to the Federal Acquisition Regulation to delete, change, or otherwise simplify unnecessary or overly restrictive acquisition regulations. As a result of the review the total line count of the regulations was reduced by approximately 30 percent with no degradation to regulatory guidance. On a continuing basis, proposed regulatory coverage will be evaluated for compliance with DOD simplifying and streamlining initiatives.

7. The DoD supports a Service sponsored program known as the DoD Contract Simplification Workshop. This program encourages field level contracting personnel from various Military Services, Defense Agencies, and Industry Groups to identify impediments to doing their job more efficiently. Some recommendations require legislative changes, however, the regulatory concerns are evaluated and presented to the DAR Council for consideration. Primary areas of concern are procedural requirements, redundancies, or eliminating layering of authority and approval levels. Success of the program will be determined by proposed changes being selected for permanent implementation.

8. DoD has completed a rewrite of the Service Contracts portion of the FAR and DFARS. This section implements the Service Contract Act and OMB Circulars A-76 (Commercial Activities) and A-120 (Consulting Services). A DAR case (88-68) is established that, when

approved, will simplify, streamline, and provide guidance to contracting activities who buy services.

9. Could cost is a new acquisition technique currently being tested within the Department. Could cost seeks to create the special challenge that a commercial marketplace poses: i.e., what could the cost and quality of the product be if we fundamentally change the way we do business by eliminating non-value added work and concentrating on delivering the best quality product, on schedule, and at the lowest possible cost. Could cost is the ultimate extension and integration of other special acquisition techniques such as total quality management, should cost, streamlining, and value engineering. Every Government specification and contract requirement (except those required by law), and every facet of the contractor's operations are open to critical examination and possible change. Innovative thinking, both in the business sense and in the technical sense, is required by both contractor and Government personnel to achieve substantial benefits on the bottom line.

10. Plans for a Computer-aided Acquisition and Logistic Support (CALS) program have been in process for some time. Through this program the DoD has developed the capability of either digital data delivery or access to contractor-maintained technical data bases. CALS is a Department of Defense and Industry initiative designed to enable and accelerate the use and integration of this digital technical information system for weapons systems acquisitions, design, manufacture and support. The use of this procedure is now required in planning for new weapon systems and related major equipment items. This Computer-aided Acquisition and Logistic Support program is structured to receive, store, distribute, and use digital weapon system technical information, including achieving the earliest possible date for digital input to DoD engineering data repositories. Although the CALS program is in the preliminary stages of operation as the cumulative impact of integration and infrastructure modernization is realized in DoD and Industry, more far-reaching changes will occur in the way functions are accomplished, leading to additional major savings. CALS implementation will result in a lower weapon system life cycle cost, shortened acquisition lead times, and improvements in reliability, maintainability and readiness.

B. RECOMMENDATION/ANALYSIS OF LEGISLATIVE ISSUES

1. Department of Defense legislative proposals to improve the procurement process submitted to Congress on March 31, 1988 that were not enacted by the 100th Congress which are appropriate for reconsideration by 101st Congress. These include proposals to:

a. Increase from three years to ten years the period allowed for Government review of contractor technical data and for Government challenges of contractor restrictions on the right to use such data for competitive procurement. This change would provide for a more realistic time frame within which to perform meaningful reviews of contractor technical data and to challenge contractor restrictions. (10 USC 2321)

b. Authorize the negotiation of subcontract plans, applicable to the corporation as a whole or to one or more of its divisions or operating segments, rather than the negotiation of individual subcontract plans for each contract. This change would significantly reduce administrative lead time and costs. (Section 8(d) of the Small Business Act 15 USC 637(d))

c. Eliminate referral to the Small Business Administration for Certificates of Competency when the next lowest responsive, responsible bidder is a small business or when the procurement is a small purchase as defined in the applicable statutes. These changes would significantly reduce administrative lead time and costs. (Section 8 of the Small Business Act 15 USC 637(b))

2. Legislative initiatives to improve the procurement process which we believe merit consideration by the 101st Congress. These include proposals to:

a. Establish a single dollar threshold at the small purchase level for applying various programs (not including the Davis-Bacon Act and Service Contracts Act) and to make certain socio-economic programs not applicable to small purchases. This change would shorten procurement lead time, reduce paperwork, and simplify small purchase procedures.

b. Facilitate the award of contracts for advisory, or assistance services by permitting, through full and open competition, the negotiation of master agreements with contractors for certain work for specified periods of time. This change would allow specific orders to be awarded to the best qualified contractors more quickly while preserving effective competition.

c. Eliminate the requirement to prepare a Justification and Approval in cases where the foreign country/customer directs the U.S. Government to procure from a specific manufacturer, and/or acquire a specific product or process. The preparation of the Justification and Approval to restrict competition in these cases is a superfluous requirement because of the direction of a foreign country/customer. It would be inappropriate for the contracting agency to change the requirement of the foreign country or international organization and purchase from a source other than that requested. The elimination of this current requirement would reduce paperwork, conserve resources, step up the acquisition process for the foreign customer and contribute to foreign customer satisfaction without negative impact on U.S. interest or initiatives. (10 USC 2304)

d. Delete the requirement for dual sourcing for the production of major weapons systems and subsystems of major systems. As currently structured, dual sourcing is required unless it can be established that dual sourcing is not in the government's interest. We believe that dual sourcing should be required only upon a determination, prior to incurring extensive start-up costs, that dual sourcing is cost effective. (10 USC 2438 Major Programs: competitive alternate sources; and section 8047 of P.L. 100-463)

e. Revise the threshold at which justifications and authorizations for the use of other than full and open competitive procedures must be approved. The $10 million threshold in the current statutory coverage for justifications and authorizations on other than full and open competitive procedures is too low. Many justifications do not warrant review at this high level and most are unchanged by the process. We believe that the Senior Procurement Executive should have the authority to delegate approval responsibility no lower than Heads of Contracting Activities for actions below $100M. This will reduce significantly administrative lead time in the procurement cycle. (10 USC 2304)

f. Revise section 2403 of Title 10, United States Code, to:

1. Permit the delegation of the authority to waive the requirement to obtain a warranty for a major weapon system to the Head of the Contracting Activity who has specific knowledge of the system;

2. Delete the requirement for written notification by the Secretary of Defense to the Committees on Armed Services of the House and Senate before each waiver of the warranty requirements for a

major defense acquisition program and substitute a requirement that Congress be advised of such waivers annually as is the current requirement for waivers granted for weapon systems that are not major Defense programs; and

3. Eliminate the requirement to notify Congress of contracts for weapon systems not yet in mature full-scale production that do not include essential performance requirements under the warranty.

g. Provide an extension of the time that an appropriation is available for obligation if the appropriation would expire during the pendency of a protest against the award of a contract where, but for the protest, the funds would have been obligated prior to their expiration. This will prevent the loss of important programs for which contracts would have been awarded that cannot be executed because the funding has expired before a contract can be awarded.

h. Amend section 2305(b)(4)(A)(ii) of Title 10, United States Code, to allow a contract to be awarded without discussions on a basis other than price alone when the award would be in the best interests of the Government. The GAO held, in B-230246 and B-230246-2 dated June 21, 1988, and B-228468 dated February 3, 1988, that when a decision was made by a contracting officer to award a contract without holding discussions with competing contractors that price must be the sole basis for making the award. This, we believe, eliminates certain advantages that could accrue to the Government from making awards without discussion where a contractor's design or technical proposal is clearly technically superior and the price is fair and reasonable. It also limits the Government's ability to select commercial products on the basis of best value rather than price alone.

i. Authorize the competitive acquisition of commercial equipment or supplies through the use of commercial-style procurement procedures.

3. The impact of acquisition policy over the last six years.

In the last six years, Congress has enacted at least 20 laws that have made major changes to the procurement system. A listing of this legislation is attached (Tab A). This legislation has resulted in the hundreds of new rules and regulations that burden both Government and Industry personnel.

Many of these legislative changes are the result of perceived problems. Certain changes have codified existing regulatory rules. Some like those dealing with Technical Data, have kept the acquisition process in a state of confusion by changing the rules several times over a relatively short period of time. Codification of existing regulations removes the flexibility that is required to rapidly make necessary changes to the process to correct problems when they occur. This can result in procurement by the book rather than encouraging innovation based upon the exercise of sound business judgment by our acquisition personnel.

A new law and a new rule for each and every problem that arises are neither needed nor desirable. Each new law and rule further complicates the procurement system, limits our flexibility to take actions to meet ever changing situations, and restricts the judgment-making ability of our acquisition personnel. This has been the real impact on the procurement process of the legislation enacted over the last six years. What is badly needed is a simplified procurement statute, not one that merely combines existing laws but one that truly simplifies a process that is too complex and burdensome.

4. The impact of existing laws and regulations on the effectiveness of the program managers and contracting officer.

There are two areas that were previously criticized for contributing to deterioration of the authority of the contracting officer:

a. DoD Directive 7640.2, Policy for Follow-up on Contract Audit Reports, limited the contracting officer's authority to resolve audit recommendations;

b. Contract auditors, rather than contracting officers, were assigned responsibility for determining final overhead and interim billing rates.

During 1988, DoD reaffirmed the authority of the contracting officer to function as a team leader in dealing with contractors. The following actions were taken:

a. DoD Directive 7640.2 was significantly revised to make it clear that the contracting officer is the final decision-maker on contractual matters.

b. The responsibility for determining final overhead and interim billing rates was reassigned to contracting officers; and

c. The Deputy Secretary of Defense issued a memorandum on June 20, 1988, clearly defining the authority of the contracting officer as the leader of the government team vis-a-vis the advisory role of other team members.

Other areas concern the layering of authority between program managers and the program executive officers. DoD has revised DoD Directives 5000.1, Major and Non Major Defense Programs Acquisitions, and 5000.2, Defense Acquisition Program Procedures. Program managers now report directly to the program executive officers, eliminating the layering of authority. No one law can be highlighted as the cause of limiting DoD's effectiveness. It is the aggregration of numerous laws that has significantly limited the program managers' and contracting officers' authority and flexibility.

C. ACTIONS TAKEN BY THE DEPARTMENT TO REDUCE DUPLICATIVE AND EXCESSIVE OVERSIGHT

As a result of recommendations made by the Packard Commission and various legislated requirements, the Under Secretary of Defense for Acquisition (USD(A)) established a joint working group consisting of representatives from the offices of the USD(A), the Inspector General (IG), and the DoD Comptroller to address the duplication problem. Many of the actions taken by the Department to reduce duplication are the result of recommendations made by the joint working group.

VISITS TO CONTRACTOR FACILITIES

The Federal Acquisition Regulation was revised on January 11, 1988, to specify that prospective visitors to contractor facilities are to provide advance information concerning the visit to on-site government personnel. This notification is for the express purpose of eliminating duplicative reviews, requests, investigations, and audits relating to the functions delegated to contract administration offices. If the visit will result in reviewing, auditing, or obtaining any information from the contractor related to functions which have been delegated to contract administration offices, on-site government personnel will determine whether information adequate to fulfill the stated requirement has recently been reviewed by or is already available within the government. If so, the prospective visitor will be referred to the government office where the information is located and the visit will be discouraged.

The Arthur Andersen study that was conducted as part of the Packard Commission's study of the issues surrounding defense management and organization found that lack of coordination was one of the principal causes of duplicative and inefficient auditing and oversight. This change in procedure will result in closer coordination and sharing of information between the contract administration activity and outside government visitors.

AUTHORITY OF CONTRACTING OFFICERS

To eliminate the perception that contracting officers are not the final decision-making authority with respect to contractual matters, the Department redefined the respective roles of the contracting officer and the contract auditor through a February 12, 1988, revision to DoD Directive 7640.2, Policy for Followup on Contract Audit Reports. The Directive now recognizes "the independent, decision-making role of the contracting officer and the financial advisory role of the contract auditor." The oversight role that was assigned to contract auditors has been eliminated, and the designated independant senior acquisition official (who served as advisor to the contracting officer on audit report recommendations with which the contracting officer did not agree) has been replaced by the normal management review process. Additionally, the dollar thresholds at which significant post-award audits must be reported to top acquisition managers and to the IG for reporting to Congress were raised to $100,000.

In June 1988, the Deputy Secretary of Defense reassigned the responsibility for determining final indirect cost rates and interim billing rates at larger contractor locations to contracting officers. This responsibility was previously held by contracting officers, but had been transferred to contract auditors in 1985. The assignment of this responsibility to contract auditors is frequently cited as contributing to the eroding authority of contracting officers.

The Deputy Secretary also issued a memorandum to the Secretaries of the Military Departments and Directors of Defense Agencies on June 20, 1988, reaffirming the authority of contracting officers and stressing their role as government team leader and final decisionmaker in all dealings with contractors. The Deputy Secretary emphasized the importance of the role played by other specialists on the government team as advisors to the contracting officer.

These actions have contributed to the restoration of the authority of individual contracting officers. To the extent that the deterioration of the contracting officer's authority as the government's team leader contributed to the problems of duplication and inefficiency in the oversight process, as alleged in the report issued by Arthur Andersen & Co. for the Packard Commission, these actions should help to alleviate duplication and inefficiency in the oversight process.

CONTRACTOR RISK ASSESSMENT GUIDE PROGRAM

In November 1988, the Secretary of Defense formally issued the Contractor Risk Assessment Guide (CRAG) for use by the Department and industry. The CRAG program is a joint DoD-industry initiative aimed at eliminating duplicative or unnecessary oversight by placing more reliance on effective systems of contractor internal control. It is designed to encourage contractor self-governance, motivate contractors to develop more effective internal control systems, and improve the effectiveness and efficiency of the Department's oversight efforts. The CRAG will assist contractors in establishing internal controls which provide DoD the assurance that direct DoD oversight can be reduced without reducing overall oversight effectiveness.

The CRAG lists internal control systems objectives for contractor indirect cost submissions, labor charging systems, material management and accounting systems, estimating systems, and purchasing systems. If a contractor can demonstrate that the internal control systems used by the company meet the stated CRAG objectives in one or more of these areas, DoD audit and oversight in the area(s) will be reduced. Reliance on the integrity of the contractor's internal control system, rather than on detailed transaction audits, results in more efficient use of the Department's audit and oversight resources and contributes to a less adversarial relationship between the Department and industry. Ultimately, the Department must retain the responsibility for deciding how much audit and oversight coverage is sufficient to protect the public interest. Participation by contractors in the CRAG program is on a voluntary basis.

INCREASE IN THRESHOLDS FOR PREAWARD REVIEWS AND AUDITS

Thresholds for preaward reviews and audits of the Department's contracts were raised from $100,000 for firm-fixed-price contracts and $250,000 for fixed-price-incentive contracts to $500,000, and from $500,000 for cost-reimbursement contracts to $1,000,000 on June 4, 1987. Defense contractors have frequently complained that there is duplication in the preaward review area; increasing the dollar thresholds reduces the number of reviews and audits that are required to be performed and therefore reduces any perceived duplication. At the same time, because of the increased emphasis which the Department is placing on the need for reliable contractor cost estimating systems and the periodic review of these systems, we believe that proper controls are in place to protect the government's interests.

Thus, by emphasizing the importance of good contractor systems and by structuring the audit and oversight function to concentrate on systems reviews rather than individual proposal reviews, audit and oversight effort can be reduced, thereby reducing the potential for duplication. The potential for defective pricing will also be reduced for contractors with good estimating systems. Additionally, the Defense Contract Audit Agency (DCAA), the Services and the Defense Logistics Agency (DLA) are working together to improve procedures for returning inadequate proposals to contractors. This will reduce the amount of time lost auditing incomplete proposals as well.

LIMITED SCOPE AUDITS

On April 29, 1988, DCAA directed its auditors to recognize contracting officer requests for audits of portions of a contractor's proposal. In the past, contract auditors would sometimes review the entire proposal submitted by a contractor even though the contracting officer might already have information available which would obviate the need for auditor review of some portions of a proposal.

This change in procedure permits the contracting officer to request an audit of only those elements of a contractor's proposal which the contracting officer needs audited; thus, the contracting officer can rely on other information which is already available and request audit coverage tailored to the specific need. This change should result in better streamlined and tailored audits in the future.

USD(A) MEMORANDUM ON CONTRACT AUDITS

On April 28, 1988, the USD(A) issued a policy memorandum directing that scarce audit resources be used on those contracts where the Department has the greatest risks to assure the best utilization of these resources. Guidelines were set forth for requesting various types of pre-award audit reports so that the request would be tailored to ask for the minimum essential information needed to ensure that a fair and reasonable price is achieved. For example, the risk of overpricing is greatest in a sole source, firm-fixed-price contracting environment and thus contracting officers will often need a full audit of a contractor's proposal. When a cost-type contract will be awarded, however, the risk of overpricing is minimal and a full audit may not be required.

INSURANCE/PENSION REVIEWS

New regulatory coverage was published on November 17, 1988, to set forth the requirements for conducting contractor insurance/pension reviews (CIPRs). This coverage clearly states the roles, responsibilities, and functions of various government personnel involved in the review process. It also clearly states that the CIPR will be the only formal review of a contractor's insurance/pension program except for periodic tests of the system.

To the extent that roles, responsibilities, and missions are clearly stated and understood, the potential for duplication is minimized.

REQUIREMENT TO OBTAIN CONTRACTOR COST OR PRICING DATA

The Department issued guidance to the Services and Defense Agencies on May 1, 1987, instructing these organizations to refrain from obtaining cost or pricing data when adequate price competition exists on a particular proposal. When cost or pricing data are not obtained because adequate price competition has been achieved, there is no requirement to obtain complete preaward reviews and audits. By emphasizing to contracting officers the need to obtain only data which are necessary for the particular procurement action, unnecessary and potentially duplicative audit and review activity is minimized.

CONTRACTOR COMPENSATION REVIEWS

As of October 1, 1987, the responsibility for performing contractor compensation reviews was transferred to one agency within the Department to preclude duplicate or overlapping reviews of contractor compensation systems and costs. By assigning this responsibility to one agency, there will be no potential for duplication in the audit and oversight of contractor compensation systems.

COORDINATION AMONG DOD INTERNAL AUDITOR ORGANIZATIONS, DCAA, AND GAO

The Department has revised its audit policy so that internal audit and review organizations are required to utilize the services of DCAA auditors whenever a review of contractor records is necessary. Internal auditors should now find it necessary to review contractor records on an exception basis only. These procedures will prevent situations where, for example, two separate audit organizations perform defective pricing reviews of the same contract, including a separate review of contractor records.

The IG issued a policy directive on June 10, 1988, to require their auditors to place more reliance on DCAA for the review of contractor records. The GAO will be asked to execute a memorandum of understanding which states that they will rely on DCAA to review contractor records whenever possible.

SPARE PARTS PRICING

The Department has paid increased attention to the area of spare parts pricing since 1983 when allegations of overpricing surfaced.

Significant changes were made to the management of the Department's spare parts mission as a result. A rigorous approach was adopted for analyzing contractors' spare parts proposals so that an in-depth evaluation is now required to ensure line item price integrity. DCAA has recently agreed to provide contracting officers additional information regarding line item pricing where it would serve to eliminate the need for additional analysis of contractor records by contract administration or procurement personnel.

A policy letter was issued on October 3, 1988, to procurement and contract administration activities informing them of the need to request specifically line item reporting by the auditor for spare parts pricing proposals. Additionally, the Department will periodically review the necessity for such in-depth analysis of spare parts proposals to determine if improvements in the pricing of spare parts are sufficient to justify reduced analysis.

SHOULD COST REVIEWS

Should cost reviews are specialized forms of cost analysis for individual contract proposals or for overhead forward pricing. A should cost review is performed by an integrated team which evaluates a contractor's proposal on a fully coordinated basis to identify uneconomical and inefficient practices in the contractor's management and operations. The resulting analyses provide the basis for a sound government negotiating position and ultimately result in achievement of more efficient and economical contractor operations.

The decision to conduct a should cost review must be made as early as possible in order to preclude duplication of review and audit effort. Preplanning with the resident contract administration and audit offices is necessary to reduce potential duplication. Information already furnished to the government should be used to the maximum extent possible, and all additional data requested from the contractor must be closely monitored and shared by team members during the review to preclude duplicate requests for contractor data.

A policy letter was issued to the Services and Defense Agencies on October 31, 1988, emphasizing the importance of these procedures in order to minimize duplication and unnecessary effort.

D. ACTIONS IN PROCESS TO REDUCE DUPLICATIVE AND EXCESSIVE OVERSIGHT

A number of additional actions designed to reduce duplication and excessive oversight have not yet been completed.

COORDINATION OF AUDIT AND REVIEW POLICIES

Audit and oversight review policies and procedures are frequently issued by organizations responsible for procurement, contract management, contract administration, and contract audit. There is currently no requirement for centralized review of these policies and procedures to ensure that they are tailored to eliminate the potential for duplication or overlap, and that responsibilities and jurisdictions are clearly assigned to the most appropriate organizations.

The Department had intended to require a review of all new policies and procedures which impose additional audit or oversight review requirements on contractors. This review would have been performed by the offices of the USD(A), the IG, and the DoD Comptroller to ensure that: a need exists for the type of review being proposed; potential duplication and overlap with other reviews is minimized; the most appropriate organization is assigned the responsibility for performing the review; mandatory professional standards (such as the auditing standards issued by the GAO) are considered; and the cost to both the government and the contractor for performing the review is considered in light of the potential benefits to be achieved.

However, the "Office of Federal Procurement Policy Act Amendments of 1988" was recently signed into law. It includes a requirement that a DoD official approve or disapprove all procurement regulations prior to their issuance in final form. Therefore, it will be necessary for the Department to evaluate this legislation to determine how it can be implemented before issuing any other requirement for review of regulations.

CONTRACTOR PURCHASING SYSTEM REVIEWS

Contractor purchasing system reviews must be conducted by the cognizant contract administration office at least every three years for contractors whose sales to the government are expected to exceed

$10 million during the next 12 months. In the period between these reviews, administrative contracting officers (ACOs) periodically test the purchasing system to ensure that the contractor is effectively managing its purchasing program. The ACO makes an annual determination to continue approval or to withdraw approval of the contractor's system. The auditor also performs comprehensive reviews of the contractor's subcontract management program, which is part of the purchasing system. Outside organizations or teams may also review the purchasing system.

Since acquisition regulations assign to the ACO the authority to review contractor purchasing systems, other organizations should not conduct separate reviews. Other organizations may participate in the review conducted by the ACO, or may recommend that an additional review be performed if they believe that a problem exists. If the ACO determines that an additional review is necessary, it should be performed as part of an ACO-initiated special review.

A working group is currently rewriting the acquisition regulations on contractor purchasing system reviews. The working group has been instructed to incorporate this policy into the revised regulation. The proposed revision will be furnished to the Defense Acquisition Regulatory (DAR) Council by December 31, 1988.

TECHNICAL REVIEWS

In some instances, auditors have obtained technical analyses from DCAA engineering/technical specialists. The Federal Acquisition Regulation and the Defense Federal Acquisition Regulation Supplement specifically assign the responsibility for performing engineering/technical analyses to the contract administration office, while DoD Directive 5105.36, Defense Contract Audit Agency, specifically assigns the responsibility for performing contract audits and providing accounting and financial advisory services to DCAA. Thus, missions and responsibilities are clearly defined through regulations already in existence.

In order to ensure that duplication or overlap of effort is avoided, the IG has agreed to issue policy guidance to require contract auditors to rely on the ACO for any technical analyses which are needed. This guidance will be issued not later than December 15, 1988. It will also provide for notification to the Deputy Assistant Secretary of Defense for Procurement if contract administration offices continually fail to provide such services. Policy letters will be issued to contract administration organizations instructing them to be fully responsive to these auditor requests.

ADDITIONAL WORKING GROUP EFFORT

Additional areas with a high potential for duplication still under review include: quality assurance systems reviews, contractor operations reviews performed by the Air Force, operational audits performed by DCAA, and security inspections performed by the Defense Investigative Service and Service organizations. Additional actions will be taken as recommendations are developed and staffed.

E. FEASIBILITY AND DESIRABILITY OF CERTAIN ACTIONS

The fiscal year 1989 Defense Authorization Act, Section 809, section (b)(5), requires the Department to report on the feasibility and desirability of each of the following issues.

ISSUE: Structuring the audit and oversight of a contractor by the Department in a manner that reasonably relates to the extent of the risk assumed by the contractor in the type of contract that is subject to the audit and oversight.

RESPONSE: Most of the reviews performed by the Department are systems reviews, rather than individual contract reviews.

The purpose of performing systems reviews is to eliminate or minimize the need for individual contract reviews. Individual contracts may be reviewed by the Department during a systems review, but the purpose of examining individual contracts is solely to test the integrity of the contractor's system. For systems reviews, the Department is concerned with verifying that a contractor has a system in place to ensure that all statutory and regulatory requirements are fulfilled. Examples of systems reviews are: estimating systems, purchasing systems, compensation systems, quality systems, and progress payment systems.

Oversight is tailored for all types of systems reviews based on the quality of the contractor's system, results of previous systems reviews, results of previous testing of the system, and the extent of the contractor's own oversight or internal review of the system. Since it is not possible to review all elements of a contractor's entire operation each year, systems that have the greatest potential for charging government contracts with significant amounts of unacceptable costs are selected for review. Before the beginning of each fiscal year, joint meetings are held between the cognizant ACO, the contract auditor, and other directly interested government representatives to coordinate selection of the areas to be reviewed during the coming year. Particular attention is focused on known weaknesses and deficiencies in the contractor's operations, and on those operations where government participation in terms of dollars allocated is the greatest. A plan is developed for reviews to be performed during the year, and the plan identifies the organizations having the primary responsibility for performing each review.

Individual contract reviews are performed for proposal reviews and audits (although the Department's recent emphasis on the importance of good contractor estimating systems serves to reduce the amount of effort required for proposal reviews and audits), and defective pricing reviews.

These reviews and audits are tailored based on the extent of risk assumed by both the contractor and the Department. For example, defective pricing reviews are rarely performed on cost-type contracts, where the Department's risk is limited to the possibility of paying too much fee because of defective pricing. In the case of firm-fixed-price contracts, however, defective pricing reviews are often performed; the Department's risk on firm-fixed-price contracts includes the possibility of paying both too much cost and too much profit. However, if the contractor has a good estimating system and defective pricing is rarely found, defective pricing reviews are generally limited in scope.

DCAA is responsible for performing all necessary contract audits for the Department and for providing accounting and financial advisory services regarding contracts and subcontracts to all DoD components responsible for acquisition and contract administration. DCAA uses a variety of methods to assure that the risk factor is considered in the development of audit plans at particular contractor locations. The use of audit plans determines the number of auditors needed at a particular location. By employing such methods, the audit agency is capable of allocating the minimum number of auditors at each location based on the risk associated with that location.

An area that has recently been improved and has the potential to reduce audit and oversight of contractor operations is that of estimating systems. A major concern has been that contractors have not been providing accurate, complete, and current cost data in their pricing proposals. One area contributing to this problem was the lack of specific and enforceable regulatory language governing the requirements for an adequate contractor estimating system. A regulatory change was made in February 1988 to clarify the requirements of such systems. It is intended that this change will reduce the potential for defective pricing by contractors and help to ensure that contractors' estimating systems produce reliable cost estimates and projections. If a contractor has an adequate estimating system which produces well-supported proposals that are acceptable as a basis for the negotiation of fair and reasonable prices, the auditor will be able to reduce significantly the scope of individual proposal audits.

In summary, the Department already does a good job of tailoring audit and oversight reviews based primarily on the risks assumed by the government. We continue to look for additional ways and additional areas where this tailoring can be accomplished. An excellent example of the Department's attempt to be innovative in structuring its review process based on the amount of risk assumed by the contractor is the CRAG program. It is discussed earlier in this report.

ISSUE: Granting authority to a senior official of the Department to receive and promptly resolve complaints of acquisition officials and defense contractors regarding allegations of duplicative oversight activities.

RESPONSE: The Department believes that it would be desirable to establish one individual as the focal point for allegations of duplicative oversight that cannot be resolved through normal channels. That is, an issue should not be elevated to this official until those at lower levels within the Department have been given the opportunity to resolve the particular complaint. The Deputy Assistant Secretary of Defense for Procurement will be designated as the focal point, and will consult with both the IG and the DoD Comptroller as necessary to resolve any allegations of duplication.

ISSUE: Establishing a formal independent means within the Department to ensure quality, integrity, and professionalism in the performance of audit and oversight.

RESPONSE: Procurement professionalism efforts within DoD have been focused on the establishment of mandatory experience prerequisites and training programs for both military and civilian personnel. Career programs have been improved and training programs have been upgraded. We have been working with the Office of Personnel Management to establish an entry-level educational requirement of 24 semester hours of business related subjects as recommended by the Packard Commission. The Department has sought Congressional support for an alternative personnel system to allow the hiring and retention of a high quality acquisition workforce. Procurement professionalism will continue to be a high priority item with the Department.

Additionally, the Services and Defense Agencies send out procurement management review teams to review the quality, integrity, and professionalism of the procurement and contract administration workforce.

One of the responsibilities assigned to the IG is to monitor and evaluate the adherence of DoD auditors to contract audit principles, policies, and procedures. The Inspector General Act of 1978, as amended, requires the IG to perform oversight reviews and issue audit policy governing all DoD audit organizations. Additionally, the

General Accounting Office has issued audit standards to be used by government auditors in the conduct of their reviews and audits.

Currently, the IG has a group of 22 senior auditors assigned to the Office of the Assistant Inspector General for Audit Policy and Oversight. Since the group was formed in 1982, it has issued a total of 65 oversight reports and 20 policy documents and manuals on various aspects of the audit organizations. The reports and policies contain recommendations and direction for improving the organizations and correcting deficiencies noted during oversight reviews.

As part of its overall responsibilities, the IG also evaluates oversight reviews performed by other DoD functions. For example, an audit of contractor executive compensation costs performed by the Assistant Inspector General for Auditing disclosed an overlap of responsibilities between DCAA and DLA in reviewing contractor compensation costs. As a result of that audit, the sole responsibility for performing contractor compensation reviews was transferred to DCAA.

One of the constant concerns of DCAA is that auditors receive adequate training. Since its inception, DCAA has made a strong commitment to specialized training for its auditors. The agency maintains a training institute on the campus of Memphis State University. The Defense Contract Audit Institute (DCAI) provides formal classroom training in all aspects of contract auditing and federal procurement regulations. The DCAI also produces training material such as video and audit tapes which are used by field audit supervisors to enhance auditors' training.

In summary, a number of formal independent means already exist to ensure quality, integrity, and professionalism in the performance of audit and oversight.

ISSUE: Establishing and implementing a policy that prohibits an organization within the Department with responsibility for oversight of contractor activities from conducting an audit or review of an activity if another such oversight organization of the Department has conducted an audit or review of that activity within a fixed period of time preceding the proposed audit or review, unless the audit or review proposed to be conducted is substantially different in type and scope from the prior audit or review and there is a compelling reason not to rely on the prior audit or review.

RESPONSE: The Department is attempting to eliminate as much duplication as possible by structuring oversight responsibilities so that specific organizations are assigned specific responsibilities to perform certain types of oversight reviews. An absolute prohibition on an across-the-board basis would potentially do more damage than good. There is no one easy solution to the problem of duplication. We have taken an approach whereby individual types of reviews have been examined and solutions have been tailored to the specific type of problem found. In some cases, the only corrective action required was to remind various organizations of their missions and functions with respect to the missions and functions of other organizations. Departmental emphasis on the elimination of duplication during the past 18 months has resulted in a greater awareness of the problem on the part of government reviewers. This increased awareness will significantly contribute to the reduction of duplication in the audit and oversight process.

As noted earlier in this report, on-site government personnel are now required to screen government visitors to contractor facilities and determine whether information already available within or recently reviewed by the government is adequate to fulfill the visitor's stated requirement. This procedure was recommended by Congress and is designed to minimize duplicative audits and reviews without imposing an absolute prohibition.

In summary, the Department does not support an across-the-board prohibition against the performance of similar reviews during a fixed period of time as the solution to the problem of duplication. We believe that the approach we have been following to reduce duplication is most appropriate.

F. STATUS OF ACQUISITION-RELATED PACKARD COMMISSION RECOMMENDATIONS

The Conference Report to the FY89 DoD Authorization Act (Report 100-989) directs the USD(A) to assess the effectiveness of the Department's implementation of the Packard Commission recommendations.

Considerable progress has been made to implement recommendations by the Packard Commission to improve acquisition policies and practices in the Department of Defense . Emphasis has been placed on maintaining greater stability and savings through purchasing at economic production rates, using multiyear contacting for procurement programs, and baselining major weapons programs to facilitate management oversight. Specific actions in these areas include the following:

- Economic production rates contribute to stability and savings by allowing a contractor to take advantage of tooling and plant capacity to produce additional units of a system at a cheaper unit cost. Of 34 major defense acquisition programs in the DoD FY 1989 amended budget submission, 30 were planned for procurement at or above the minimum economic production rate.

- Multiyear contracts for production of defense systems allow contracts to plan and invest with more confidence and enable them to buy more economic order quantities of many components of the system. Total savings from multiyear procurements since FY 1982 will exceed $7.5 billion. In the FY 1989 DoD budget, seven multiyear candidates were approved by Congress with an estimated total savings of $942 million.

- The acquisition baseline is a formal agreement between the OSD and Service leadership to manage the program based on specific performance, schedule, and cost objectives. Deviations from these objectives trigger a review to either restore the program to the baseline parameters, revise the baseline agreement, or cancel the program. The policy has been improved to link closely the establishment of the program baseline with major milestone reviews. The Under Secretary of Defense for Acquisition now approves the baselines giving high priority to the efficient implementation of this policy.

DoD submitted its first two-year (FY88-89) budget in January 1987. The two-year budget was a serious effort to promote stability and consistency in defense budgeting. Regrettably, Congress did not act on the two-year budget. The contribution of this recommendation to program stability will depend largely on the cooperation of Congress. DoD will continue the two-year cycle of planning, programming, and budgeting defense requirements, and will submit a biennial defense budget for FY 1990/FY 1991.

DoD is seeking to achieve the important objective of excellence emphasized in the Packard Commission recommendations by embarking on Total Quality Management (TQM). This initiative emphasizes continuous process improvement in every facet of acquisition. It requires top management to seek fundamental change in how the acquisition community views product quality. We have issued a DoD posture statement on Quality outlining the principles and guidelines for implementation of TQM. We are developing DoD policy to ensure that TQM measures are applied in acquisition planning and throughout all aspects of program execution. As the quality-first concept inherent in TQM is shown to benefit the defense sector, it will help lead a renaissance of quality throughout the United States.

More action is also needed to implement the Commission recommendation to enhance the quality of DoD acquisition personnel. This includes improving the senior-level appointment system—simplifying financial disclosure statements, enacting legislation for an alternative personnel management system based on the China Lake model—simplified classification and salaries reflecting market conditions, and better training for all acquisition personnel.

Some progress has been made in this area. The Administration, through the Office of Personnel Management (OPM), recommended legislation to Congress that adopts much of the personnel management system based on the China Lake model. The legislation was not enacted in the 100th Congress, and is expected to be recommended again. Additionally, at the request of DoD, OPM established a requirement for 24 hours of business related courses for contracting personnel.

In summary, progress has been made. However, a lot of work remains to be done. Implementation of the Commission's recommendations remains a high priority in DoD and will require the cooperation of Congress and industry.

CERTAIN LEGISLATION WITH IMPACT ON DOD ACQUSITION /PROCUREMENT

PUBLIC LAW AND YEAR OF ENACTMENT	TITLE OF LAW AND BRIEF DESCRIPTION
P.L. 98-72 (1983)	A Bill to Improve Small Business Access to Federal Procurement Information Amended the Small Business Act to revise synopsizing requirements.
P.L. 98-94 (1983)	DoD Authorization Act for 1984 Called for the use of Independent Cost Estimates for Major Defense Programs, established a Director for Operational Test and Evaluation and required a report to Congress on Spare Parts Management.
P.L. 98-212 (1983)	Department of Defense Appropriations Act for Fiscal Year 1984 Added procurement policy coverage for the first time that: Required DoD to obtain Weapons Systems Guarantees (warranties) from contractors and prohibited the purchase of commercial products if a small business would be rejected do to lack of commercial acceptance of its item.
P.L. 98-369 (1984)	Competition in Contracting Act Revised terminology for contracting, set strict standards for obtaining competition, established revised protest procedures and revised synopsizing requirements.
P.L. 98-473 (1984)	Department of Defense Appropriations Act for Fiscal Year 1985 Added procurement policy coverage for the first time that: Prohibited initiation of full scale engineering development of a major system prior to notification to Congress of a competitive procurement plan or the reasons why not and required notification of Congress of Multiyear contracts with an economic order quantity in excess of $20 million.

PUBLIC LAW AND YEAR OF ENACTMENT	TITLE OF LAW AND BRIEF DESCRIPTION
P.L. 98-525 (1984)	Defense Procurement Reform Act of 1984 (part of the DoD Authorization Act for 1985) Established requirements for the use of prequalification procedures, provided controls and requirements governing technical data, set rank and grade for competition advocates, established tours of duty for Program managers, established rules for allocating overhead to spare parts, established rules governing the commercial pricing of spare parts (lowest commercial price), revised and codified requirement for weapons systems guarantees passed under P.L. 98-212 required identification of suppliers and sources of items provided under contracts and called for various reports to Congress.
P.L. 98-577 (1984)	Small Business and Federal Procurement Competition Enhancement Act Required mandatory publication of procurement regulations in the Federal Register for a public comment period, revised synopsizing requirements, and provided for the placement of Small Business Administration Spare Parts Breakout representatives in major DoD acquisition centers.
P.L. 99-145 (1985)	Defense Procurement Improvement Act of 1985 (part of the DoD Authorization Act for 1986) Codified the description of allowable costs under DoD contracts, required dual sourcing of major defense programs, codified requirements for Should Cost analyses, set "Revolving Door Rules," set penalties for overcharging by contractors and directed the use of "Work Measurement Standards" in certain contracts.
P.L. 99-190 (1986)	The Omnibus Appropriations Continuing Resolution for 1986 Required employment of Alaska and Hawaiian residents in military constructions contracts in those states, and revised allowable costs description enacted under P.L. 99-145.

PUBLIC LAW AND YEAR OF ENACTMENT	TITLE OF LAW AND BRIEF DESCRIPTION
P.L. 99-433 (1986)	Department of Defense Reorganization Act Required procurement policy staffs of Military Department to be organized at Secretarial level.
P.L. 99-500 (1986)	The Omnibus Appropriations Continuing Resolution for 1987 and Defense Procurement Improvement Act of 1986 Added procurement policy coverage for the first time that: Established the duties of the Under Secretary of Defense for Acquisition, restricted undefinitized contractual actions, revised law pertaining to to commercial pricing for spare parts (P.L. 98-525), revised the Truth in Negotiations Act, provided preference for nondevelopmental items, revised progress payment rates, established competition requirements for the acquisition of prototypes of major systems, revised technical data requirements and expanded ADP protest procedures within the General Services Administration for DoD contracts.
P.L. 99-661(1986)	DoD Authorization Act for 1987 Duplicated the Defense Procurement Improvement Act of 1986 and established a 5% of procurement, R&D and construction dollars authorized goal for the award of contracts to minorities and authorized the payment of a 10% premium for the purposes of achieving this goal.
P.L. 99-634(1986)	Anti-Kickback Enforcement Act of 1986 Prohibits subcontractor kick-backs to government prime contractors.

PUBLIC LAW AND YEAR OF ENACTMENT	TITLE OF LAW AND BRIEF DESCRIPTION
P.L. 100-180 (1987)	National Defense Authorization Act for Fiscal Years 1988 and 1989 -- Title VIII, Acquisition Policy Provided for Congressional Oversight of cost or schedule variances in certain programs and authorized Congress to consider programs as milestone authorization despite not having been identified as such by the SecDef, amended the Truth in Negotiations Act to revised definitions previously revised under P.L. 99-500, directed that contracting officers performance evaluations include their ability to increase awards to minority firms, substantially revised the law pertain to rights in technical data, established rules governing contractor costs for special tooling and special test equipment and placed restrictions on the purchase of foreign made administrative motor vehicles.
P.L. 100-202(1987)	The Omnibus Appropriations Continuing Resolution for 1988 Restricted purchases from Toshiba and Kongsberg Vsapenfabrikk, required a ten day advance notification to Congress prior to terminating multi-year contracts, required the USD(A) to approve all fixed price R & D contracts with a value of $10 million or more and limited the acquisition to domestic sources of: certain classes of machine tools, mooring and anchor chain, super computers and equipment items that use textiles.

PUBLIC LAW AND YEAR OF ENACTMENT	TITLE OF LAW AND DESCRIPTIONS OF CERTAIN PROCUREMENT POLICY ITEMS
P.L. 100-456 (1988)	The National Defense Authorization Act for FY 1989 contains the following provisions. Integrated Finance Policy - §801 - Requires establishment of a long term plan to ensure that DoD profit policies are kept current. - Requires a yearly report to Congress on efforts to prevent excess profits - Establishes a Public / Government Advisory Committee to consider the profit issue and report to Congress on their findings. Evaluation of Contracts for Professional Services [Uncompensated Overtime] - §804 - Requires the SecDef to establish criteria for use in the award of contracts that do not encourage the use of uncompensated overtime. - Establishes an Industry / Government Advisory Committee to consider how to do this and report to Congress on their findings. Incentives for Innovation - §806 - Rights in Technical Data -- prohibits the DoD from requiring prime contractors to submit proposals that will enable the U.S. to acquire competitively items that were developed at private expense. Guidance on the Use of Fixed Price Development Contracts - §807 - Revises and codifies requirement for approval of fixed price contracts by the USD(A) previously enacted as part of the FY 88 Appropriations Act. Department of Defense Advisory Panel on Government Industry Relations - §808 - Establishes an Industry / Government Advisory Committee to consider ways to enhance DoD and industry cooperation on such matters as self governing oversight programs, debarment procedure, and alternative disputes procedures. - Requires the Panel is to report to Congress on their findings.

ADDITIONAL ACTS PASSED IN 1988	TITLE OF ACT
H. R. 5210	OMNIBUS DRUG INITIATIVE ACT OF 1988 Provides for drug free workplace initiatives on the part of government contractors.
S. 2215	OFFICE OF FEDERAL PROCUREMENT POLICY ACT AMENDMENTS OF 1988 Establishes a Federal Acquisition Regulatory Council to manage, coordinate, control and monitor the maintenance and issuance of changes to the Federal Acquisition Regulation; reestablishes a Cost Accounting Standards Board within the Office of Federal Procurement Policy; and, sets certain integrity requirements for contractor and government employees.
H.R.1807	BUSINESS OPPORTUNITY DEVELOPMENT REFORM ACT OF 1988 Provides for the payment of liquidated damages by contractors who do not make a good faith effort to meet small business and small and disadvantaged business subcontracting goals; establishes a test of the ability of small business firms to compete on an unrestricted basis for certain contractual requirements (e.g. construction, refuse removal, A-E Services) where the percentage of awards going to small firms has been historically high; and, establishes a new category of emerging small business firms who are entitled to certain preferences.

PUBLIC LAW AND YEAR OF ENACTMENT	TITLE OF LAW AND DESCRIPTIONS OF CERTAIN PROCUREMENT POLICY ITEMS
P.L. 100-456 (1988) [continued]	Regulatory Simplification and Streamlining of Oversight Activities - §809 - Requires a report to Congress on internal DoD efforts to streamline acquisition procedures. Standards for Contractor Inventory Accounting Systems[MRP] - §834 - Requires the Department of Defense to establish a policy governing inventory accounting systems that is already in existence and requires contractors certification of the system.
P.L. 100-463 (1988)	Department of Defense Appropriations Act for Fiscal Year 1988 -- This Act: Revised coverage applicable to Foreign Selling Costs, Directed the Office of Federal Procurement Policy to establish policies and regulations, applicable to the Department of Defense and other Agencies, establish conflict of interest standards for consultants, and added new classes of items to the list of machine tools that can be purchased only from domestic sources.

Senator BINGAMAN. The report will provide a starting point for our inquiry in this 101st Congress. There are a number of key questions that we will be asking, not only about the DOD report, but about the overall approach of the Department to acquisition policy. Let me just list a few of those questions:

Has the Department structured its regulatory simplification program in a manner that encourages reform?

Has the Department met the statutory requirements to establish evaluation criteria and timetables to implement lessons learned from regulatory simplification programs?

Does the report contain a comprehensive analysis of the effect of existing laws and policies on the capability of the Department efficiently and effectively to meet the national defense needs of the United States, and if not, what areas not addressed by the report are in need of legislative and regulatory reform?

To the extent that the Department has addressed areas in need of legislative reform, has the Department proposed meaningful and well-considered fixes to those problems?

Has the Department undertaken a realistic effort to reduce duplicative oversight?

Has the Department made significant improvements in its implementation of the Packard Commission's recommendations?

Does the Department's acquisition and reform program adequately address the role of contracting officers and program managers?

Has the Department effectively implemented recent legislative initiatives?

Today we will hear from two independent experts in the field of acquisition policy. Our first witness is Paul Math, the Director of Research, Development, Acquisition, and Procurement Issues for the General Accounting Office. Mr. Math will present us with the GAO's views on the DOD report and GAO's recommendations on acquisition policy in general.

Our second witness is Derek Vander Schaaf, the Deputy Inspector General of the Department of Defense. Mr. Vander Schaaf will assess DOD's progress in correcting acquisition policy weaknesses previously identified by the Inspector General. He will also provide us with general recommendations on acquisition policy issues.

Both witnesses bring to our subcommittee distinguished records of public service and outstanding credentials in this field of acquisition policy. First let me welcome Mr. Math to present the views of the General Accounting Office. We are very pleased to have you. If you would like to introduce your colleagues, that would be fine.

STATEMENT OF PAUL F. MATH, DIRECTOR, RESEARCH, DEVELOPMENT, ACQUISITION, AND PROCUREMENT ISSUES, NATIONAL SECURITY AND INTERNATIONAL AFFAIRS DIVISION, ACCOMPANIED BY DAVID COOPER, ASSISTANT DIRECTOR, AND WILLIAM WOODS, OFFICE OF GENERAL COUNSEL

Mr. MATH. Thank you, Mr. Chairman. It is a pleasure to return to your subcommittee to once again discuss procurement reform. On my left and your right is Dave Cooper. He is an assistant group director in our group. On my right, your left, is Bill Woods, who is with our Office of General Counsel.

Before dealing with the specific issues, I would like to briefly comment on the recurring and systemic nature of acquisition problems facing DOD. Complaints about complex procurement laws and regulations, multi-layered organizational structures, and ineffective acquisition work force are problems that have been associated with defense acquisition as far back as the 1949 Hoover Commission. Unfortunately, we face those same problems today.

Over the years, DOD has made a strong commitment to implement numerous reform initiatives, the latest being in response to the Packard Commission. Historically, the agency's initial sense of commitment has dissipated over time and the problems remain. We cannot afford to let that happen again. What is crucial to success is a strong and continuing top-level management commitment.

This subcommittee, through the fiscal year 1989 National Defense Authorization Act, recognized that DOD must place greater priority on streamlining and simplifying the procurement process. The act encouraged DOD to make greater progress by requiring a report on its actions to improve the acquisition process. This reporting requirement was designed to enhance congressional oversight and ensure DOD attention to acquisition reform measures.

In December 1988, DOD, as required by the act, reported numerous reform efforts. We support those efforts, but have concerns about DOD's progress in bringing about meaningful change in several areas. Let me briefly discuss them.

The act required the Under Secretary of Defense for Acquisition to comprehensively analyze how existing procurement laws, regulations, and guidelines affect DOD's capability to efficiently and effectively meet the country's national defense needs. The act also required the Under Secretary to recommend legislation considered appropriate to improve that capability.

DOD's report lists 20 laws enacted in the last 6 years that DOD believes have made major changes to the agency's procurement system. DOD provided no analysis of how the laws affected its capability but concluded that they burdened both government and industry, reduced the agency's flexibility, and complicated the procurement system. Rather than identifying specific problems with existing laws, DOD states that what is badly needed is a simplified procurement statute.

While there has been a proliferation of laws and regulations over the last several years, each law was enacted to deal with a particular problem. The comprehensive analysis required by the act is necessary before any of those laws are changed or eliminated. Without such an analysis, it is difficult to identify what specific changes, if any, are needed.

DOD's report proposes 12 specific legislative changes to simplify the procurement process, but again contains no analysis of how the proposed changes will improve DOD procurement procedures. The report's descriptions of anticipated improvements from the proposed changes are vague. In several instances the report states that the proposed changes would reduce administrative lead times. In other cases, no specific benefits are identified. For example, DOD proposes changing the legislation dealing with weapons system warranties by reducing the approval level for waiving warranties and reporting waivers annually instead of as they occur. Whether there is a problem and whether it stems from either the legislatively imposed approval level or reporting requirements is not clear. Our work has shown that there have been very few requests for waivers because the military services have been unable to effectively show whether our waivers are cost beneficial.

Another DOD proposal recommends that the head of contracting activities, rather than the senior procurement executive, approves using other than full and open competitive procedures on procurements costing between $10 million and $100 million. DOD believes that this will significantly reduce administrative lead time. Changing the approval level, however, does not reduce either the analysis needed to justify the decision or the documentation required. It is not clear from DOD's report how changing the level of approval will significantly reduce administrative lead time. Furthermore, the report does not discuss whether or not the proposed changes will continue to meet the purpose of the existing legislation.

In terms of streamlining the aquisition organizational structure, the Packard Commission recommended substantial changes in the defense acquisition process in several specific areas, including organization, decisionmaking practices, and management. Among other things, the Commission recommended streamlined acquisition organization with centralized policy making and decentralized execution at the program management level. The Commission proposed reducing to two the number of levels and people between the Under Secretary of Defense for Acquisition and the program managers for major programs. To accomplish this, the service acquisition executives and the program executive officers would oversee major acquisition programs and the service acquisition executives would report directly to the Under Secretary for Acquisition. This new organizational structure was meant to reduce the potential for intervention in program matters by officials outside the streamlined chain of command and strengthen the authority and responsibility of the individuals who play an extremely critical role in the acquisition process.

DOD has established the organizational structure recommended by the Packard Commission. However, our work and recent reports by the Project on Monitoring Defense Reorganization and the Institute on Defense Analysis suggest that the new structure does not have the decisionmaking authority and control of resources envisioned by the Commission. Rather, the decisionmaking authority and control over resources remain with the pre-existing organizational structure. Thus, while the organizational structure has been modified, it has not substantially changed or clarified program managers' lines of authority and program managers see little changes in their jobs.

The act also required the Under Secretary to report efforts to prevent duplication of audit and oversight and discuss the feasibility and desirability of several specific methods of meeting this objective.

DOD reported that it has taken, or is in the process of taking, several actions to use its audit and oversight resources more effectively, including: (1) raising the threshold for preaward audits from $100,000 to $500,000; (2) defining the roles and responsibilities of the various DOD organizations responsible for reviewing contractor systems and operations; (3) instructing contracting officers not to request cost or pricing data when adequate price competition exists; and (4) emphasizing the early use of cost reviews and close coordination among the should cost team members to preclude duplicate requests for contractor data. While in many cases these actions are restatements or clarification of existing DOD policies, they should result in more effective use of DOD's audit and oversight resources.

We believe two of the initiatives, in particular, hold the greatest promise for using DOD audit and oversight resources more effectively.

First, on June 10, 1988, the DOD Inspector General issued a new policy to improve coordination in DOD audits of the contractors' records. The policy provides that DOD audit organizations, including the Inspector General, the Air Force Audit Agency, the Naval Audit Service, and the Army Audit Agency will normally rely on the Defense Contract Audit Agency to review contractor records. Detailed implementing procedures for the policy were not issued until February 1989, and it is therefore too early to determine its actual effect.

The second significant initiative is the establishment of the Contractor Risk Assessment Guide program in November 1988. The program is designed to encourage contractors to develop more effective internal control systems and reduce DOD oversight in areas where contractors demonstrate adequate internal control systems. By assessing the validity of internal control systems instead of extensively auditing transactions, DOD can make better use of its oversight resources.

GAO has long supported the need for effective internal control systems. Accountability for compliance with the applicable procurement statutes and regulations must start with industry. The first line of defense in controlling fraud, waste, and abuse is an adequate control system that is fully supported at all levels of a company. An adequate control system permits a company to institute preventative steps as opposed to reacting after the fact.

While the program is conceptually sound, cultural changes are required by both industry and government if the program is to succeed. Industry's incentive to voluntarily participate in the program is the prospect of reduced oversight. Whether oversight will be reduced or merely shifted to other areas remains to be seen. Industry has approached this program with caution. In fact, as of April 1989, less than a handful of contractors have volunteered to participate in the program.

Many of the corporations involved with long-term government contracts are subject to the provisions of the Securities and Exchange Act's recordkeeping and internal accounting control requirements. The recordkeeping requirements mandate records which are designed to accurately and fairly reflect transactions and disposition of assets. The control provisions require that the company devise and maintain a system of internal accounting controls sufficient to provide reasonable assurances that certain specified objectives are attained. However, while the companies must file annual reports and other information with the Securities and Exchange Commission, the control and reporting provisions do not specifically cover cost, price, estimating, billing, and performance measurement controls, nor do they require reporting on such controls.

It may be time to consider legislation which would require annual management reports by the defense contractors on their internal controls and an independent public accountant's opinion on management's representation. The Federal Manager's Financial Integrity Act of 1982 establishes a similar concept for Federal agencies.

In terms of developing an integrated financing plan: The 1989 National Defense Authorization Act requires the Secretary of Defense to develop and keep current a plan to ensure that DOD contract financing, profit, and risk-sharing policies are integrated to meet the agency's long-term needs for industrial resources and technology innovation. The act requires the Secretary to review the plan annually and report the results of the review to the House and Senate Armed Services Committee in conjunction with the submission of the 5-year defense program.

The act recognizes that DOD policies must be adequately integrated to: (1) stimulate efficient contract performance; (2) not discourage companies from seeking government business; and (3) promote investment to enhance productivity and provide for a sound and viable industrial base. DOD's 1985 Defense Financial and Investment Review, last year's industry-sponsored study by the MAC group, and the recent study by the Aerospace Industries Association all recognize the need for integrating DOD contract financing and profit policies.

DOD submitted its 5-year defense program this year without the required plan. DOD reported that it is waiting for preliminary assessments from the advisory committee before proceeding with the integrated financing policy.

The act required DOD to establish an advisory committee to develop recommendations concerning methodology for measuring contractor return on investments.

We believe current and consistent contractor profit data is essential to an effective DOD assessment of how its financing and profit policies impact industry. However, DOD currently lacks such data.

In the past DOD has relied on ad hoc studies to assess how its policies are working to achieve profit levels that are equitable to industry and provide contractors sufficient incentive to invest profits in capital facilities. Reliance on ad hoc studies, however, has neither provided DOD the management information needed for effective decisions nor will it provide DOD with the information necessary to comply with the act. Such management information must be based on accurate and current data, and consistent and appropriate analysis.

Contractors and DOD are opposed to the profit reporting program that we recommended in 1987. Despite that resistance, we remain convinced that our proposal would provide DOD the information needed to adequately assess how existing and pending policies impact industry. We also believe that such a reporting program would provide DOD the information that is essential in developing an integrated financing plan as required by the act.

Finally, the Packard Commission made a number of recommendations designed to achieve a balance between military capability and low life-cycle costs. Among other things, the Commission recommended that DOD make greater use of commercial products and reduce excessive reliance on rigid military specifications. We support the need for DOD to buy commercial products where feasible. Our recent work, however, shows that DOD has not placed the management emphasis needed to ensure that full advantage is taken of existing laws and regulations to procure commercially available items. We recommended that DOD expedite guidance, provide training, and collect data on the extent it buys commercial items.

The Commission also recommended that DOD increase the use of commercial-style procurement procedures that emphasize quality and performance as well as price. The Office of Federal Procurement Policy, with assistance from DOD, is developing a legislative proposal to establish streamlined, commercial-style, competitive procedures for buying commercial products. We plan to evaluate the proposal when it is finalized. It is not clear, however, which type or volume of products would be procured using procedures other than those currently available.

We support efforts to increase the value the Government receives for its procurement dollar. We agree with those who contend that buying on the basis of price alone is often short-sighted and unwise. We do not agree, however, that such price-driven buying is mandated by current law, particularly the Competition in Contracting Act. We find nothing in the current law that requires agencies to buy goods and services based on the lowest-cost, technically acceptable offer, without considering quality and performance. Current law allows agencies to use whatever source selection criteria they believe strike the appropriate balance between price and technical factors.

Mr. Chairman, that concludes our prepared statement. We would be happy to address any questions you might have.

[The prepared statement of Mr. Math follows:]

Statement of
Paul F. Math
Director, Research, Development, Acquisition, and
Procurement Issues
National Security and International
Affairs Division

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to appear before the subcommittee today to discuss Department of Defense (DOD) acquisition reform efforts. My testimony will focus on DOD actions to (1) analyze existing procurement laws and regulations, (2) streamline its acquisition organization, (3) reduce excessive and duplicative audit and oversight, (4) develop an integrated financing plan, and (5) make greater use of commercial products.

Before dealing with these specific issues, I would like to briefly comment on the recurring and systemic nature of the acquisition problems facing DOD. Complaints about complex procurement laws and regulations, multi-layered organizational structures, and an ineffective acquisition workforce are problems that have been associated with defense acquisition as far back as the 1949 Hoover Commission. Unfortunately, we face those same problems today.

Over the years, DOD has made a strong commitment to implement numerous reform initiatives--the latest being in response to the President's Blue Ribbon Commission on Defense Management (better known as the Packard Commission). Historically, the agency's initial sense of commitment has dissipated over time and the problems remain. We cannot afford to let that happen again. What is crucial to success is a strong and continuing top-level management commitment.

This subcommittee, through the Fiscal Year 1989 National Defense Authorization Act, recognized that DOD must place greater priority on streamlining and simplifying the procurement process. The Act encouraged DOD to make greater progress by requiring a report on its actions to improve the acquisition process. This reporting requirement was designed to enhance Congressional oversight and ensure DOD attention to acquisition reform measures.

In December 1988, DOD, as required by the Act, reported numerous reform efforts. We support those efforts, but have concerns about DOD's progress in bringing about meaningful change in several areas. Let me briefly discuss them.

ANALYZING EXISTING PROCUREMENT LAWS, REGULATIONS, AND GUIDELINES

The Act requires the Under Secretary of Defense for Acquisition to comprehensively analyze how existing procurement laws, regulations, and guidelines affect DOD's capability to efficiently and effectively meet the country's national defense needs. The Act also requires the Under Secretary to recommend legislation considered appropriate to improve that capability.

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While there has been a proliferation of laws and regulations over the last several years, each law was enacted to deal with a particular problem. The comprehensive analysis required by the Act is necessary before any of those laws are changed or eliminated. Without such an analysis, it is difficult to identify what specific changes, if any, are needed.

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For example, DOD proposed changing the legislation dealing with weapon system warranties by reducing the approval level for waiving warranties and reporting waivers annually instead of as they occur. Whether there is a problem and whether it stems from either the legislatively imposed approval level or reporting requirements is not clear. Our work has shown that there have been very few requests for waivers because the military services have been unable to show whether waivers are cost beneficial.

Another DOD proposal recommends that the heads of contracting activities rather than the Senior Procurement Executive approve using other than full and open competitive procedures on procurements costing between $10 million and $100 million. DOD believes this will significantly reduce administrative leadtime. Changing the approval level, however, does not reduce either the analysis needed to justify the decision or the documentation required. It is not clear from DOD's report how changing the level of approval will significantly reduce administrative leadtime. Furthermore, the report does not discuss whether the proposed change will continue to meet the purpose of the existing legislation.

STREAMLINING THE ACQUISITION ORGANIZATION STRUCTURE

In June 1986, the Packard Commission recommended substantial changes in the defense acquisition process in several specific areas including organization, decision-making practices, and management. Among other things, the Commission recommended a streamlined acquisition organization with centralized policy making and decentralized execution at the program management level. The commission proposed reducing to two the number of levels and people between the Under Secretary of Defense for Acquisition and program managers for major programs. To accomplish this, Service Acquisition Executives and Program Executive Officers would oversee major acquisition programs, and the Service Acquisition Executives would report directly to the Under Secretary. This new organizational structure was meant to reduce the potential for intervention in program matters by officials outside the streamlined chain of command and strengthen the authority and responsibility of the individuals who play an extremely critical role in the acquisition process.

DOD has established the organizational structure recommended by the Packard Commission. However, our work and recent reports by the Project on Monitoring Defense Reorganization and Institute on Defense Analyses suggest that the new structure does not have the decision-making authority and control of resources envisioned by the Commission. Rather, the decision-making authority and control over resources remains with the pre-existing organizational structure. Thus, while the organizational structure has been modified, it has not substantially changed or clarified program managers' lines of authority and program managers see little change in their jobs.

REDUCING DUPLICATIVE AND EXCESSIVE OVERSIGHT

The Act requires the Under Secretary to report efforts to prevent duplication of audit and oversight and discuss the feasibility and desirability of several specific methods of meeting this objective.

DOD reported that it has taken, or is in the process of taking, several actions to use its audit and oversight resources more effectively. Actions include (1) raising the threshold for preaward audits from $100,000 to $500,000, (2) defining the roles and responsibilities of the various DOD organizations responsible for reviewing contractor systems and operations, (3) instructing contracting officers not to request cost or pricing data when adequate price competition exists, and (4) emphasizing the early use of should cost reviews and close coordination among should cost team members to preclude duplicate requests for contractor data.

While in many cases these actions are restatements or clarification of existing DOD policies, they should result in more effective use of DOD's audit and oversight resources.

We believe two of the initiatives, in particular, hold the greatest promise for using DOD audit and oversight resources more effectively. First, on June 10, 1988, the DOD Inspector General issued a new policy to improve coordination in DOD audits of contractor records. The policy provides that DOD audit organizations, including the Inspector General, the Air Force Audit Agency, the Naval Audit Service, and the Army Audit Agency will normally rely on the Defense Contract Audit Agency to review contractor records. Detailed implementing procedures for the policy were not issued until February 1989, and it is therefore too early to determine its actual effect.

The second significant initiative is the establishment of the Contractor Risk Assessment Guide program in November 1988. The program is designed to encourage contractors to develop more effective internal control systems and reduce DOD oversight in areas where contractors demonstrate adequate internal control systems. By assessing the validity of internal control systems instead of extensively auditing transactions, DOD can make better use of its oversight resources.

GAO has long supported the need for effective internal control systems. Accountability for compliance with applicable procurement statutes and regulations must start with industry. The first line of defense in controlling fraud, waste, and abuse is an adequate control system that is fully supported at all levels of a company. An adequate control system permits a company to institute preventative steps as opposed to reacting after the fact.

While the program is conceptually sound, cultural changes are required by both industry and government if the program is to succeed. Industry's incentive to voluntarily participate in the program is the prospect of reduced oversight. Whether oversight will be reduced or merely shifted to other areas remains to be seen. Industry has approached the program with caution. In fact, as of April 1989, less than a handful of contractors have volunteered to participate in the program.

Many of the corporations involved with long-term government contracts are subject to the provisions of the Securities and Exchange Act's recordkeeping and internal accounting control requirements. The recordkeeping requirements mandate records which are designed to accurately and fairly reflect the transactions and disposition of assets. The control provisions require that the company devise and maintain a system of internal accounting controls sufficient to provide reasonable assurances that certain specified objectives are attained. However, while companies must file annual reports and other information with the Securities and Exchange Commission, the control and reporting provisions do not specifically cover cost, price, estimating, billing, and performance measurement controls nor do they require reporting on such controls.

It may be time to consider legislation which would require annual management reports by defense contractors on their internal controls and an independent public accountant's opinion on management's representation. The Federal Manager's Financial Integrity Act of 1982 establishes a similar concept for federal agencies.

DEVELOPING AN INTEGRATED FINANCING PLAN

The Act requires the Secretary of Defense to develop and keep current a plan to ensure that DOD contract financing, profit, and risk-sharing policies are integrated to meet the agency's long-term needs for industrial resources and technology innovation. The Act requires the Secretary to review the plan annually and report the results of the review to the House and Senate Armed Services Committees in conjunction with submission of the Five Year Defense Program.

The Act recognizes that DOD policies must be adequately integrated to (1) stimulate efficient contract performance, (2) not discourage companies from seeking government business, and (3) promote investment to enhance productivity and provide for a sound and viable industrial base. DOD's 1985 Defense Financial and Investment Review, last year's industry sponsored study by the MAC group, and the recent study by the Aerospace Industries Association all recognize the need for integrating DOD's contract financing and profit policies.

DOD submitted its Five Year Defense Program this year without the required plan. DOD reported that it is "waiting for preliminary assessments from the advisory committee before proceeding with the integrated financing policy." The Act required DOD to establish an advisory committee to develop recommendations concerning methodology for measuring contractor profits.

We believe current and consistent contractor profit data is essential to an effective DOD assessment of how its financing and profit policies impact industry. However, DOD currently lacks such data. In the past, DOD has relied on ad hoc studies to assess how its policies are working to achieve profit levels that are equitable to industry and provide contractors sufficient incentive to invest profits into capital facilities. Reliance on ad hoc studies, however, has not provided DOD the management information needed for effective decisions. Such management information must be based on accurate and current data, and consistent and appropriate analysis.

In September 1987, we proposed a legislative action to establish a program to report contractor profitability. The program would require:

- --a consistent and appropriate analytical methodology to evaluate profitability,

- --a means for systematically establishing the integrity of the studies and the reliability of contractor-furnished data, and

- --mandatory contractor participation.

Contractors and DOD are opposed to our profit reporting program. Despite that resistance, we remain convinced that our proposal would provide DOD the information needed to adequately assess how existing and pending policies impact industry. We also believe such a reporting program would provide DOD the information that is essential to developing an integrated financing plan as required by the Act.

DOD EFFORTS TO BUY COMMERCIAL PRODUCTS AND USE COMMERCIAL-STYLE PROCUREMENT PROCEDURES

The Packard Commission made a number of recommendations designed to achieve a balance between high military capability and low, life-cycle costs. Among other things, the Commission recommended that DOD make greater use of commercial products and reduce excessive reliance on rigid military specifications.

We support the need for DOD to buy commercial products where feasible. Our recent work, however, shows that DOD has not placed the management emphasis needed to ensure that full advantage is taken of existing laws and regulations to procure commercially available items. We recommended that DOD expedite guidance, provide training, and collect data on the extent it buys commercial items.

The Commission also recommended that DOD increase the use of commercial-style procurement procedures that emphasize quality and performance as well as price. The Office of Federal Procurement Policy, with assistance from DOD, is developing a legislative proposal to establish streamlined, commercial-style, competitive procedures for buying commercial products. We plan to evaluate the proposal when it is finalized. It is not clear, however, which type or volume of products would be procured using procedures other than those currently available.

We support efforts to increase the value the government receives for its procurement dollar. We agree with those who contend that buying on the basis of price alone is often short-sighted and unwise. We do not agree, however, that such price-driven buying is mandated by current law, particularly the Competition in Contracting Act. We find nothing in current law that requires agencies to buy goods and services based on the lowest-cost, technically acceptable offer, without considering quality and performance. Current law allows agencies to use whatever source selection criteria they believe strike the appropriate balance between price and technical factors.

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Mr. Chairman, that concludes my statement. We will be pleased to respond to any questions.

Senator BINGAMAN. Thank you very much. Before I ask any questions, let me defer to Senator Wallop for any statement he might have.

Senator WALLOP. Mr. Chairman, let me ask in the interest of time that my statement be included in the record as if delivered and only say that I am glad to be able to be here and welcome these gentlemen.

[The prepared statement of Senator Wallop follows:]

PROPOSED STATEMENT BY SENATOR MALCOLM WALLOP

Mr. Chairman, I join you today in welcoming our witnesses. Improving the management of the defense acquisition process has been a major focus of efforts of the executive and legislative branches since the issuance of the Carlucci Initiatives in 1981. Since that time, our attention has shifted from spare parts procurement practices to transforming the organization of systems acquisition to abuses in the source selection process in the Department of Defense.

Given the great distance that the Subcommittee on Defense Industry and Technology and its predecessors have covered, it is appropriate that we get our bearings before moving on. The series of hearings we begin today could not be more timely. At this moment, Secretary of Defense Cheney is assembling a new team to oversee management of the Defense Department. Very shortly we hope to begin the confirmation process on a nominee for the position of the Under Secretary of Defense for Acquisition.

President Bush has vowed to implement not only the letter but the spirit of the Packard Commission recommendations on defense management. To fulfill this pledge, he has directed that a team of analysts conduct a thorough review of the Department of Defense and make recommendations. It is my understanding that this Defense Management Review will be briefed to the President before the end of this month. The Senate Armed Services Committee will have a key role to play in supporting and overseeing the implementation of those recommendations.

The basic principles set out by the Packard Commission remain sound. For efficient acquisition of major defense systems, any organization should possess clear command channels with unencumbered decision authority placed firmly in the hands of managers at the lowest levels. Budget stability is also a prerequisite as is the need to operate with small, highly qualified staffs. Effective communication with the users must be assured. Finally, adequate resources must be made available for testing and prototyping.

Although the Department of Defense has made significant progress in all of these areas, for various reasons we continue to fall short of developing an environment completely embodying these and other sound management principles. The current management transition may be the best opportunity we have to reform this system for many years.

I am pleased that we will be hearing from Mr. Paul Math of the General Accounting Office and Mr. Derek Vander Schaaf of the Defense Department Office of the Inspector General this afternoon. Both of these witnesses can assist us in developing an effective oversight role. With their help, we can better ask the right questions and structure the milestones and standards by which to measure the progress or lack thereof in bringing about change in the organization and practices of the defense acquisition system.

The process of implementing the Packard Commission recommendations and the Goldwater-Nichols Reorganization Act has graphically demonstrated that large bureaucratic organizations necessarily change slowly. We should not delude ourselves into believing that conducting studies or enacting laws against bad judgment will of themselves improve any management organization. We can only hope to achieve meaningful reform through detailed and consistent oversight of the defense acquisition management system stretching over many years. Mr. Chairman, I look forward to working with you in that effort.

Senator **Wallop**. With the new Secretary of Defense and very shortly this subcommittee's chore of passing judgment on the Under Secretary of Defense for Acquisition, and the Bush administration's commitment to the Packard plan, it is very timely that we get involved in it.

I would just remind us all of the wonderful quote from Albert Speer. Within the Third Reich, when they finally destroyed the German high command's acquisition center in the bombing raid in Berlin, that thereafter, despite all the interventions in factories and bombings, and other kinds of things, they never had an acquisition problem again. [Laughter.]

One of the things that worries me in this process is that in our pursuit of integrity, we bind those who have it into an incapacity to act, and I think we have to be careful as to how we do that, how we perform our role, and perhaps a big chunk of it ought to be to remove a lot of barriers from criteria and to efficient actions, especially in the area of the world of auditing.

I thank you and look forward to the hearings.

FILLING KEY POSITIONS

Senator **Bingaman**. Mr. Math, as you know—Senator Wallop referred to this—we do not yet have appointed the key people in the Department of Defense who are going to be the lead in these matters. I gather that Under Secretary Costello and Deputy Under Secretary Lohr are leaving their positions sometime in the next week. Assistant Secretary Katzen plans to depart in the near future, and we have not yet received any nominations for those positions. We have got to get people in place over there before we really can have much of a dialogue with the administration on what needs to be done.

My question to start out is that it seems to me that the business of procurement reform is sort of a staple in our diet around here. We almost seem to have built an institution that works on that. We have got groups in Congress. We have got groups in the administration. We have got your organization. Is there any way to reach a plateau or to get to a stage where we can look back and say yes, significant progress has been made there? I know that there is a lot of frustration on all sides, but it seems to me it is almost as though if we ever got this thing reformed, we would not have anything to do. That is sort of the attitude. It is not an explicit attitude, but I do not see any sense of urgency on the part of the administration in actually getting anything done about this and I did not see any in the prior administration. I would be interested in any comments you have on that.

RESTORATION OF FAITH AND CONFIDENCE

Mr. MATH. Mr. Chairman, I think the major challenge ahead for a new USDA is to provide the needed restoration of faith and confidence in the whole acquisition process. I think the situation today is not unlike the situation in the 1960s when Melvin Laird came into the position as Secretary of Defense. His leadership and the team that he brought in is often used as a model for an effective acquisition organization, especially in the Department of Defense. He had three major challenges. He had the challenge of withdrawing from Viet Nam; adjusting to and eliminating the draft; and reducing the defense budget substantially. Success is measured on how well you satisfy objectives, and he satisfied all three.

Now, we do not have to worry about a draft. We have some decisions ahead with regards to a possible reduction in the cold war and most assuredly we have significant decisions that have to be made in terms of reducing the planned defense budget, i.e., the 5-year defense plan that was discussed before the full committee yesterday by the Comptroller General.

How was that accomplished? First of all, in talking to the experts, two things seem to stand out. First of all, Secretary Laird was able to choose his team, and second, the team was very proactive rather than reactive. I think that is essential.

As I recall, the first issue that hit the procurement community in the last administration was the spare parts horror stories. The first announcement out of the Secretary of Defense is that DOD found that. Well, it is true, the DOD IG did find the horror stories and we applaud them for doing so, but it was not the managers of the programs that found the problems, identified them, and solved them.

Senator BINGAMAN. If you were to be advising this new administration when these new people are appointed about what specific problems they ought to be proactive on and try to get out in front of, what would you recommend in this procurement area?

PACKARD COMMISSION RECOMMENDATIONS

Mr. MATH. I would start with the Packard Commission. I think that it is essential and I think there is no better time to make sure that the problems identified by the Packard Commission are addressed. These problems have been identified by commissions time and time again dating back to the Hoover Commission and the Procurement Commission of 1972.

First of all, in talking with the experts, the number one problem is the people problem. We have to make sure that we have qualified highly-skilled people onboard. We issued a report several years ago on the capabilities of program managers and contracting officers.

FIXING PEOPLE PROBLEMS

Senator BINGAMAN. What specifically do you recommend be done to fix that people problem?

Mr. MATH. There are three areas that need attention. The first area is training.

Senator BINGAMAN. Training of who?

Mr. MATH. Training of program managers and contracting officers, those directly involved in the acquisition of major systems and supporting systems thereof. The second is an effective career path for program managers to provide the necessary training, experience, and development. We have career paths obviously for the operations people. We also need that type of career path for program managers, including promotion up through the general and admiral levels.

Senator BINGAMAN. Are you talking about on the military and on the civilian side?

Mr. MATH. Yes, sir.

Senator BINGAMAN. Both sides.

Mr. MATH. Both sides. Third, we need tenure. We need the continuity of acquisition people within a particular weapon system that not only provides for continuity, but in turn provides accountability.

What we found in our report, and what seems to continually occur is that we have the rotation of program managers in and out of the programs, that is, three program managers in 5 years. It is very difficult to assign accountability to those people.

Even with the best trained program managers and the best acquisition strategies, I think the biggest problem right now is that we have too many systems chasing too few dollars. When we have to make the cuts, we do not make the cuts on a vertical basis. We make them on a horizontal basis. Therefore, if a program manager establishes an outstanding acquisition plan that includes the type of things that you want to see and were recommended by the Packard Commission, like competition through full-scale development, prototyping, et cetera, if you start cutting horizontally, you start cutting out those types of things. You end up with one sole source contractor and that sole source contractor has been obtained or chosen based on design competitions only. There is no hardware, there is nothing to evaluate other than a design. If you lock into one contractor, you are going to experience the problem that the Packard Commission and other commissions have identified over the years.

Senator BINGAMAN. So are you saying the people issue is the first concern that needs attention?

Mr. MATH. Yes, sir.

Senator BINGAMAN. And the second concern that needs attention—how many did you list for us? Let me just be clear.

Mr. MATH. The first is the people. Second is to address the external influences, and funding is the most important external influence that adversely impacts on the people. I am not saying more funding—I am just saying better decisions. Third, is that the USDA has to continue to address the fraud, waste, and abuse in contracting through the effective internal controls, whether it be self-governance, the CRAG program, or whatever.

Senator Bingaman. One of my frustrations here on this committee, quite frankly, is that as we continue to receive testimony on these problems, we have not been able to get anything very concrete in the way of legislative recommendations to fix the problems. I do not know that they all require legislative solutions, but the argument is made that some do and that even those that do not require legislative solutions we might consider doing some legislation just to ensure that they actually happen.

This report that came out in December had a line in there which you referred to in your testimony about what is badly needed is a simplified procurement statute; we do not have any recommendations as to how to get from here to there. How do you recommend to those of us in Congress to get the Department of Defense to focus on the legislative changes that need to take place to the extent that we need legislative changes? I think that is an area of continued frustration as we have gone along.

Senator Wallop. Mr. Chairman, before Mr. Math responds, could I just ask that certain questions that I have be submitted for the record? There is a hearing on uranium, which I think you may have an interest in and Senator Simpson is the lead witness, and I wish to go over there.

Senator Bingaman. Yes, they will be included in the record.

GOVERNMENT CAREERS

Senator Wallop. One other thing. If you would not mind commenting after you respond to Senator Bingaman's questions, and these are not my written questions, but it is just basically this, that is, do you worry that the competent people may not wish Government career paths because of excessive caution in the Office of Government Ethics or what we have, and I note with some dismay, the resignation of two senior NASA officials, and is there not some way that we can contemplate the world of post-Government employment in such a way that people are not locked forever into Government or must forever refuse to serve?

Senator Bingaman. Please address either of those questions.

Mr. Math. I think the DOD authorization legislation last year should be applauded and I think the pressure needs to continue on the Department of Defense to come forth with recommended changes in either existing legislation or the need for additional legislation. Those proposals have to be supported, as you and as the legislation requested, with substantial and comprehensive analysis. If the analysis is not there, it is difficult for anyone to support the changes without knowing the cost-benefit relationships.

As I said earlier, there is a specific purpose in every piece of legislation that is passed, and it serves an objective, and that objective has to be evaluated in relation to what the administration or the agency believes are cumbersome procedures. Until that is done, you really cannot evaluate whether or not those cumbersome procedures, or the elimination thereof, are worth the original benefits that were desired from the legislation.

I think last year's legislation called for a one-time reporting requirement. Annual reporting to the Armed Services Committee may be needed to assure that the Secretary of Defense understands the concern in terms of procurement reform.

ILL WIND SCANDAL

Senator BINGAMAN. One question we are going to be asked, all of us in Congress are going to be asked when this defense authorization bill is finished this year and when Congress adjourns this fall, is what did we do to deal with the problems of this "Ill Wind scandal," which I gather will continue to bubble along here as the Federal courts do their work. Is there anything that you have seen in the recommendations made to us by the Department, or in the report that we have obtained, that we could point to and say yes, this is something we did to fix that problem?

Mr. MATH. I believe that it is still too early to tell what is needed in terms of legislation to solve the problem. Obviously, careful review is needed in two important areas. The first one is consultants and how they are being used within the Department of Defense and by the contractors. The other one is what information should and should not be available to the contractors during the negotiation process.

We are in the process of evaluating the OFPP draft regulations on consultants. In addition, we are looking at case studies that will show how DOD and contractor consultants are actually being used in the acquisition process, and whether or not changes are needed to either reduce their involvement or provide better controls on what they do.

CONSULTANTS AND LEGISLATIVE CHANGES

Senator BINGAMAN. When will your review be done? We are going to go to mark-up in June. Are you in a position by the middle of June to tell us what your recommendations are in the area of consultants, legislative changes affecting consultants to the Department of Defense?

Mr. MATH. It is my understanding that testimony is tentatively scheduled in the June time frame. I am not sure how early in June, but I would be happy to talk to the staff involved with that effort and have them contact your staff to discuss this further.

NEGOTIATIONS

Senator BINGAMAN. What about this other area of negotiations, what information should be supplied to bidders and contractors. Is that an area that you think requires legislative attention, and if so, do you have recommendations?

Mr. MATH. We are not addressing that issue. I believe the DOD IG has done some work in that area, and might be talking about it this afternoon. We have not done any recent work in that area, so we are not prepared to recommend legislation at this time.

OFPP PROPOSAL

Senator BINGAMAN. When I think about the Packard Commission recommendations, the two areas of specific recommendations that they made where it seems to me we have made the least progress are one, the people issue, and two, this issue of trying to get the Department of Defense to use commercially available products to a greater extent. You have referred to both of these. You talked about this OFPP proposal that is being developed to deal with the problem Government-wide. Could you elaborate on what you recommend this committee try to do to encourage or incentivize the Department of Defense to use commercially available products to a greater extent?

Mr. MATH. We recently completed a review on what we call nondevelopmental items, commercial products. We said that some actions were taken by DOD, but more needs to be done and more emphasis needs to be directed in the Department of Defense.

For example, DOD created the position of Assistant for Commercial Acquisition. We found that person was dedicated approximately 25 percent of his time on that effort rather than full time. So I think it has to be a full-time effort and emphasis on the part of DOD.

DOD was in the process of developing and revising the guidance that is essential to get out to the contracting people that are going to be identifying and contracting for commercial items. That was a slow process and there was a significant delay in the number of months it took to get the guidance out. Also, DOD personnel need additional training in this area. There was some training on the commercial products, but it was not universal across the board. For example, they were training program managers out at the Defense Systems Management College, but that does not get to all the procurement people. It did not get to the contracting people. So there is much more training needed to identify opportunities to contract for commercial items. So those were basically the three areas of concern: the amount of attention given; the delay in developing the guidance for the managers; and the need for additional training for consistent application in the field.

Senator BINGAMAN. What is required by Congress to get this job done? That recommendation, of course, was in 1986. As you pointed out in your opening statement, this was not the first time that this had been recommended. We are still saying that much more needs to be done. What can Congress do to get action in this area?

Mr. MATH. I think one other thing needed is to focus on the extent of the problem. I think Congress could ask the Department of Defense to identify the type and value of commercial products we are talking about so that we can get a clear understanding of what needs to be done. Much of what DOD buys is not commercially available to everyone else. DOD should identify where the efforts should be directed and what types of items should be covered rather than coming out with broad and general directives that state you should consider commercial products when you acquire something. I think more focused direction is needed and you start with identifying the magnitude of the universe and the problem.

Senator BINGAMAN. So you think that this year the best we can probably do in that area is to require them to collect and report more information about what can be done and where the opportunity areas are?

Mr. MATH. I think that is the best starting point, Mr. Chairman.

PEOPLE IN GOVERNMENT

Senator BINGAMAN. Let me direct your attention to Senator Wallop's question where he was talking about the problems of people in the private sector going into Government and whether or not that is something we need to be addressing here legislatively. I would be anxious to hear anything you would like to say on that subject.

Mr. MATH. I think that is a valid concern with regards to people coming into Government. I think the conflicts and the potential conflicts, but also the pay, are issues of significant concern. However, I would also put forth a word of caution on the conflict. We are working and have worked on revolving-door type legislation to establish protections for the Government contracting process. We have to be careful not to negate or override those protections in the interest of correcting the problem on the other side of the coin, i.e., not being able to get top quality people into the Government.

REVOLVING DOOR

Senator BINGAMAN. I guess it was contemplated that the executive branch was to publish comprehensive and detailed rules to deal with this revolving-door area after the legislation that was passed, and that has not happened. Are you aware of what has happened or what needs to be done?

Mr. MATH. I would like to have Bill Woods answer that question.

Mr. WOODS. The FAR committees put out proposed regulations a couple of months ago and asked for public comment. My understanding is that just today, interim regulations were published in the Federal Register that are due to go into effect on Monday. So I think they have complied with the requirement to come up with the regulations.

Senator BINGAMAN. Do you have an independent view as to the appropriateness of those regulations? Do they properly implement the intent of Congress?

Mr. WOODS. The interim regulations just came out today, so we really have not focused on them. They are different in substantial respects from the proposed regulations, so I think we are going to have to take a hard look at those interim regulations.

Senator BINGAMAN. I was just told that they really just restate the statute. Is that accurate and are you able to comment on that?

Mr. WOODS. I have not really read the interim regulations in depth.

Senator BINGAMAN. We appreciate your testimony very much and we would certainly welcome, as we go through the next several weeks, any specific recommendations that you might have as to what we could do to help in this area. We are anxious to play a constructive role in dealing with some of these problems and, quite frankly, we do not see a whole lot of direction coming from the administration as to what needs to be done. If you have suggestions as to how we could fill that vacuum, please let us know.

Mr. MATH. We will, Mr. Chairman.

Senator BINGAMAN. Thank you very much.

Mr. MATH. Thank you, Mr. Chairman.

Senator BINGAMAN. Mr. Vander Schaaf, please come forward and we will hear your testimony now.

STATEMENT OF DEREK J. VANDER SCHAAF, DEPUTY INSPECTOR GENERAL, DEPARTMENT OF DEFENSE

Mr. VANDER SCHAAF. Thank you, Mr. Chairman, for inviting us here this afternoon. I am pleased to testify and in a sense follow-up on the hearing you held last September. I felt that the hearing was particularly successful on your part and I think it clearly demonstrated that Congress and an individual committee of Congress can be very effective in getting things done in this acquisition process even though you do not pass legislation. Your follow-up to that hearing was tremendously effective in moving four or five or maybe half a dozen regulations and other management policy changes that needed to be made along through the process. So I appreciate these kind of hearings and I look forward to trying to provide my small bit to your bigger process over here.

I have a rather long statement and I ask that it be included in the record. I also have a very short written statement that I would like to read. I think it will make some points and then we can follow-up on those points, many of which you discussed briefly with the General Accounting Office.

As I said, last September Inspector General Brown and I appeared before you and expressed the following general views: (1) DOD responses to the "Ill Wind" investigation were reasonable, given the limited information available to the Department from the investigatory process; (2) DOD has sufficient authority to manage the acquisition process, but could be more aggressive in using certain aspects of that authority; (3) contractor self-governance can be developed into a fully acceptable, reliable adjunct to direct government oversight in many instances; (4) we need to do more to develop a top quality DOD acquisition work force; and (5) more aggressive action is needed to enable more timely changes to acquisition regulations and to eliminate inefficiency in the Government's oversight of contractors. I continue to hold those views.

I am pleased to be able to call your attention to several very positive developments on the matters which Ms. Brown and I testified to last fall. First, we have had some notable breakthroughs recently in the Voluntary Disclosure program and the Contractor Risk Assessment Guide program. These are two of the most crucial DOD industry initiatives against contract fraud and waste. Working with the Department of Justice, we have formulated a new standard Voluntary Disclosure Agreement which meets previous concerns that may have been deterring contractor participation in the program.

We have also gotten the CRAG program underway and are quite pleased with the initial industry reaction. I have attached in my statement, for information purposes, a letter from the chairman of the Board of General Dynamics on the CRAG program. I am hopeful that the CRAG will be a useful vehicle in promoting and improving the contractor internal controls.

I am also pleased to note that the completion of long awaited action to publish guidelines for contractor cost estimating systems in the FAR has been accomplished. Likewise, action is nearly complete on strengthening the Government's ability to protect itself from unreliable contractors, including subcontractors who have been previously suspended or debarred when they served as prime contractors.

In other areas, Mr. Chairman, evidence of progress is mixed, with obvious indications that more remains to be done. For example, while some efforts are being made to tighten DOD management of contract advisory and assistance services, our auditors continue to find problems.

Many DOD activities remain inordinately dependent upon consultants. Likewise, the DCAA has reported for the second time very poor internal controls regarding consultants employed by a broad spectrum of defense contractors. The DCAA found that almost a quarter of the costs incurred at audited facilities for professional and consultant services were unallowable or questionable. I would also surmise that a lot of other consulting costs incurred by contractors which were deemed allowable and reasonable would not have been incurred had the costs not been allowed to be billed back to the Government.

Most observers seem to recognize the need to attract top quality people in the Government acquisition jobs, to train them well, and to retain them. It was disappointing to us, Mr. Chairman, that so far Congress has failed to enact your proposal for alternative personnel systems within the DOD acquisition structure. I hope that you and the subcommittee will persevere with that legislation.

Likewise, I urge that the DOD be given more waiver authority to hire military retirees without penalty. This would help us retain vital expertise in-house and reduce dependence on consultants.

Guidance has been issued to eliminate duplication in several aspects of DOD oversight of contractors. That guidance needs to be institutionalized and enforced. Several other areas still need to be reviewed to see if additional guidance is needed there as well. I assume that we will discuss those areas more this afternoon. In other areas, Mr. Chairman, we are basically in the same situation as last fall. I believe that the Department should take an aggressive stance toward promoting the wider use of work measurement in defense industry.

I feel that much better DOD guidance to the military services is needed on when and how to perform analysis on the advisability of breaking out weapon system components for competition. I think the DOD could make far better use of the Truth in Negotiations Act to protect itself from defective pricing. The acquisition community disagrees and has not fully implemented our recommendations in those areas. We are doing additional audit work pertaining to both subjects to develop more data. We continue to find instances of noncompliance by the services with requirements for submitting information needed to DOD decisionmakers of weapon systems as they move through the various milestones.

We continue to be frustrated by the slow, unpredictable DOD and Government processes for revising acquisition regulations.

Mr. Chairman, I understand that the subcommittee plans a series of hearings to examine the complex issues involving acquisition policy in a systematic way. I certainly endorse that approach.

As you assess where we are and where we ought to be going, I hope you will come to agree with me that it ought to be possible to control costs without punishing honest, efficient contractors. Whether the proper tools should be work measurement, value engineering, total quality management, should cost, some sort of productivity incentives, or a mix of such things, we need to stop merely buying costs and relying on historical cost experience and worrying excessively about profit margins instead of the cost base underlying the entire program.

With those remarks I will conclude and try to attempt to answer your questions, Mr. Chairman.

[The prepared statement of Mr. Vander Schaaf follows:]

STATEMENT BY

DEREK J. VANDER SCHAAF, DEPUTY INSPECTOR GENERAL

DEPARTMENT OF DEFENSE

Mr. Chairman and Members of the Subcommittee, I am pleased to testify before you this afternoon on the subject of Defense acquisition policies and management. I will attempt to address the wide range of subjects mentioned in your invitation letter.

My remarks this afternoon are based on the oversight and investigative activities of the Office of the Inspector General in the Defense acquisition area. The information gleaned from our audits, investigations, and other reviews, as well as the positions we have developed based on that experience, are regularly provided both to the Congress and to top DoD management. Hearings such as this are opportunities to summarize our body of work on issues of mutual interest to the Congress and the Department, and I hope that I can contribute in this way to a fruitful dialogue. I might add that the information and views which I am presenting today have also been presented to DoD top management and the President's Transition Team.

President Bush has explicitly endorsed the Packard Commission recommendations to streamline the Defense acquisition process. The Under Secretary of Defense for Acquisition provided a report to the Congress in December 1988 on measures taken thus far to simplify and streamline acquisition procedures. In addition, I expect the Defense Management Review, which was directed by the President and is currently well under way, to analyze and add impetus to those areas where progress has been slow.

Ms. June Gibbs Brown, the DoD Inspector General, and I expressed the general views to you last September that:

-- The DoD responses to the Ill Wind investigations were reasonable, given the limited information available to the Department from the investigatory process;

-- the DoD has sufficient authority to manage the acquisition process, but could be more aggressive in using certain aspects of that authority;

-- contractor "self-governance" can be developed into a fully acceptable, reliable adjunct to direct Government oversight in many instances;

-- the basic causes for human error in acquisition matters are inadequate training, excessive personnel turnover, poor morale, and the increasing difficulty in attracting top quality people to public service; and

-- more aggressive action is needed to enable quicker changes to regulations and eliminate inefficiency in the oversight effort.

I continue to hold all of those views. As I will relate later in my statement, there have been positive developments over the past several months in certain areas. It is obvious, however, that there are no clear, easy answers to some of the problems confronting us and more action is needed on several fronts.

CONTRACTOR "SELF GOVERNANCE"

The first specific area I will mention today is contractor "self-governance." There have been two notable breakthroughs recently. As you know, my office is directly involved in two fundamental aspects of the "self-governance" initiative: the Voluntary Disclosure Program and the Contractor Risk Assessment Guide Program.

Under the Voluntary Disclosure Program, companies are encouraged to disclose apparent civil or criminal fraud to the DoD. Since its formal inception in 1986, the program has resulted in 127 disclosures and the recovery of $65.8 million. During 1988, however, the program appeared to be losing momentum. The exact meaning of terms such as "cooperation" had proven to be an issue on several occasions. Lack of clarification and agreement seemed to be discouraging contractors from making disclosures. To resolve those problems, the Department of Justice and my office have formulated a new, standard Voluntary Disclosure Agreement to be executed by the Government and contractors when disclosures are admitted into the program. I am very pleased with the outcome of that effort, and I feel that a significant, potential barrier to industry participation has been eliminated.

The joint DoD/industry effort to develop the Contractor Risk Assessment Guide (CRAG) was completed in November 1988, and that program is now fully under way. The CRAG specifies internal control objectives in certain key aspects of contractor operations (indirect cost submissions, labor charging, material management and accounting systems, cost estimating systems, and purchasing). If contractors demonstrate that effective controls are in place, the Government agrees to align its oversight effort to avoid auditing well controlled areas. The CRAG breaks new ground by strongly and explicitly encouraging openness by both the Government and contractors, to their mutual advantage. I believe that the program will do a great deal to improve understanding of what the Government views as adequate internal controls and the rationale for our contract audit plans. Conversely, the Government will gain a better understanding of contractor internal control efforts, and both parties will have a better basis for constructive dialogue on how to achieve further internal control improvements.

The DCAA has now completed an extensive CRAG training effort for its auditors, and the Council of Defense and Space Industry Associations has sponsored three regional CRAG training conferences. At this point, the program is being administered by the contracting officers, contract auditors and industry officials, who are working together at each participating company to share information and develop sound plans for developing, testing and documenting effective contractor internal controls.

It will be some time before the extent of industry participation in the CRAG initiative and the program's impact on DoD oversight requirements are clear. Preliminary indications are positive--I would like to enter correspondence on the CRAG from the Chief Executive Officer, General Dynamics Corporation, into the record as an attachment to this statement.

The progress of DoD efforts to encourage contractor "self-governance" will be closely monitored. The matter is included in the DoD Management Improvement Plan and will be addressed periodically by the Defense Council on Integrity and Management Improvement. I also urge the Congress to lend its full support to these DoD/industry initiatives.

ACQUISITION PERSONNEL

Another critical area is that of the quality we are able to maintain in the DoD acquisition workforce. Mr. Chairman, I applaud the considerable interest this Subcommittee has taken in matters related to personnel policies affecting the DoD acquisition workforce. Some acquisition problems are caused by faulty or unrealistic policies and procedures, but many others are caused by noncompliance with regulations, inattention or misjudgement. Human errors of omission and commission are far more prevalent when the personnel management system is too cumbersome and inflexible, when pay is not competitive with rival economic sectors and organizations, when spheres of authority are poorly defined and there is duplicative organizational effort, when training is not adequately emphasized, when recruitment and retention of high quality personnel is difficult, and when morale is not optimum. Audits and inspections have confirmed that these kinds of workforce problems exist to various degrees in a large number of DoD organizations, especially among those performing such crucial acquisition tasks as contract administration, quality assurance, property administration, and contracting.

On a macro level, the public attitude toward government service, which directly affect the pay and self esteem of public employees, is at an all-time low.

The picture on the military side is considerably brighter than on the civilian side, where the Civil Service still labors under increasingly widespread perceptions of public service as a poor career choice. The DoD is limited in what it can do to revise their perceptions; however, it can take steps at all management levels to improve personnel management, promote professionalism, reward competence, let both military and civilian employees know that their efforts are appreciated, place a high priority on training even when budgets are very constrained, insist on the degree of competence and adherence to high ethical standards appropriate for an elite workforce, and critically reconsider the allocation of staffing resources among functions and management levels. Such measures are needed throughout the Department; however, the need is most critical in the acquisition area.

I support efforts to upgrade the training, professional status, and pay of personnel in crucial acquisition job series. I believe that the legislation you have sponsored, Mr. Chairman, to implement alternative personnel systems for DoD civilian acquisition personnel is sorely needed. Moreover, I urge the Congress to provide greater waiver authority to the DoD for hiring military retirees without penalty. It makes little sense to encourage a brain drain from the Government by forcing retired military personnel with badly needed skills to become contractors/consultants instead of civil servants. This policy expands our overdependence on consultants and appears to cost much more.

Finally, I hope that the Congress can act expeditiously on the President's proposals to streamline, equalize coverage under, and otherwise improve the Federal ethics laws. We need a period of stability in this area so that people can plan their careers and so that the laws can be clearly understood and uniformly enforced.

UPDATE ON PREVIOUS ISSUES

Mr. Chairman, your invitation letter asked that I update the Subcommittee on the status of the other issues I discussed before you last September. Some information along those lines was provided to you in former Deputy Secretary Taft's March 1989 memorandum. I will not repeat all of that information, but I will comment on each item that Ms. Brown and I mentioned last fall.

CONSULTANT SERVICES

In my previous testimony, I advised you that the Audit Committee of the President's Council on Integrity and Efficiency had recommended a variety of Office of Management and Budget actions to improve Government management of contracted advisory and assistance services (CAAS). In response to congressional direction, the OMB is currently working on a revision to Circular A-120 to redefine CAAS. A variety of actions recommended by the President's Council on Integrity and Efficiency (PCIE) to improve CAAS management, accounting and reporting should be taken by OMB and all Federal agencies as soon as the new OMB guidance is issued. I am hopeful, of course, that the revised guidance will be helpful to managers. I intend to work with OMB through the PCIE toward that end.

Meanwhile, in compliance with title 31 of the United States Code, my Audit staff has reviewed the DoD consulting services annually. Our latest report has shown that substantial progress has been made in implementing management controls and accounting procedures. The report did conclude, however, that further improvements are needed because there are still significant deficiencies in accounting and reporting on consulting services. For example, we found that the $8.7 million reported for consulting services for the 49 contracts we reviewed during our latest audit was understated by $21.7 million. We also found that DoD had not fully implemented accounting procedures or presented budgets in full compliance with congressional requirements for disclosure of the level of consulting services used. We have made recommendations to correct those deficiencies and will continue our oversight in this critical area.

I support the Navy initiatives to decrease dependence on contractors for services and expertise which should be available inhouse to avoid problems with conflict of interest and to ensure the integrity of Navy decision making processes.

USE OF CONSULTANTS BY CONTRACTORS

The problems related to consultants hired by industry and charged to Government contracts also still remain. The Defense Contract Audit Agency (DCAA) conducted a special audit of consultant costs being charged to DoD contracts by a representative number of large contractors. The DCAA report concluded that contractors were spending considerable sums supplementing virtually every in-house activity with professional and consultant services. The purchased services including lobbying, sales/marketing, management, legal, technical/engineering, accounting, auditing, actuary, insurance, recruitment, training, medical, and other services. The DCAA determined that almost a quarter of the $237 million of such costs incurred at the audited facilities were questionable under Federal Acquisition Regulation (FAR) cost principles, primarily because of contractors' inability to provide adequate documentation of the nature and extent of services received. The audit also found examples of weaknesses in every significant internal control area related to professional fees and consultant costs. Actions have been or are being taken by the Under Secretary of Defense (Acquisition) to address the DCAA recommendations. The DCAA plans to accelerate reviews of charges for consultants by other large Defense contractors, with reports to be issued by the end of this month. Consultant costs will also continue to be a high priority item in all DCAA incurred cost audits.

CONTRACTOR OVERSIGHT

Last September I expressed my disappointment that progress in reducing the level of duplicative DoD oversight of contractors had slowed drastically in the preceding few months. I am pleased, therefore, to report that several actions occurred after the hearing that hopefully will reestablish momentum in this vital area. Specific actions were as follows:

-- The Under Secretary of Defense for Acquisition issued policy letters in October 1988 on Should Cost reviews and on the audit or cost analyses of spare parts. The former emphasized the importance of coordination between Should Cost teams, auditors, and contract administration personnel. The latter advised procurement and contract administration activities to specifically request DCAA to report on spare parts pricing proposals at the line item level, in order to avoid the need for additional analysis of contractor records by procurement or contract administration personnel.

-- In November 1988 the DoD regulatory changes were published to eliminate overlapping responsibilities for conducting contractor insurance/pension reviews. Those changes took five years, but are now in effect.

-- In December 1988 my office issued policy guidance requiring contract auditors to rely on contract administration activities for engineering/technical analyses, instead of performing such work with inhouse personnel. The DCAA is to advise the Deputy Assistant Secretary of Defense for Procurement if contract administration organizations are not responsive to auditor requests for such support. Thus far, no problems have been reported.

-- In January 1989 the Under Secretary for Acquisition issued a policy letter instructing the Military Departments and Defense Agencies to eliminate nonessential visits by program management personnel to contractor plants. In recent years, oversight visits to contractor plants by program office personnel have been far more frequent than visits by auditors.

While each of these measures represents progress, to eliminate duplication the Department will have to maintain heavy emphasis on avoiding duplicative oversight and will have to demand full compliance with both the letter and the spirit of the new guidance. It is important that all of the policy letters and memoranda issued to address this matter be institutionalized in the Defense Federal Acquisition Regulation Supplement (DFARS) and the implementing procedures of DoD contracting activities as quickly as possible.

My staff is participating on a DoD working group to determine what additional guidance is needed. The joint working group needs to review five more areas where there appears to be duplication: quality assurance reviews, EDP reviews, operations audits, contractor operations reviews, and security inspections. Action is also needed in the areas of contractor purchasing system reviews and coordination of audit/oversight policy.

I have recommended that the impact of these measures on the level of audit and oversight be assessed in a thorough followon study. The results should be reported to the Secretary of Defense and the Defense Council on Integrity and Management Improvement.

SUSPENSION AND DEBARMENT OF SUBCONTRACTORS

My office had been pressing since 1984 for changes to regulations to close loopholes in the suspension and debarment process. In March 1988, the Defense Acquisition Regulatory Council adopted language to cover most of our concerns, but coverage pertaining to subcontractors remained weak.

I am very pleased to report that the Deputy Assistant Secretary of Defense for Procurement and I worked out mutually acceptable language in December 1988. I understand that the revision has been approved by both the DoD and Civilian Agency councils and will be published shortly. The revised coverage will address a major weakness in the Government's ability to protect itself from unreliable or untrustworthy contractors. The new guidance:

-- Extends the effect of immediate government-wide debarment to contractors which are proposed for debarment.

-- Requires prospective bidders to certify information regarding suspensions, debarments, indictments and convictions against the company and its principles.

-- Requires the prime contractor, which is seeking to use a debarred subcontractor, to make a compelling needs determination, and to notify the Government, prior to entering into the subcontract, about that determination.

WORK MEASUREMENT

I believe that the expansion of work measurement systems in Defense industry could significantly reduce costs. In 1986 my office conducted an extensive study of the use of work measurement standards and engineered labor hours in the Defense industry. We concluded that there is vast potential for improving productivity and efficiency in contractor operations through more vigorous application of these modern management tools. I want to emphasize my conviction that the expanded use of work measurement would hold exciting possibilities for driving down overall costs--a far more significant target than is mere profit control, which unfortunately has tended to attract more attention in the past. We recommended that DoD establish a policy requiring work measurement systems based on engineered labor standards for certain prime and subcontracts. We suggested the delineation of specific contracting officer and contractor responsibilities, accuracy criteria for the engineered labor standards, and requirements for revisions to MIL-STD-1567A and specialized training programs. In May 1987, Secretary Weinberger advised Senator Grassley that "most if not all" of our recommendations would be adopted.

The final Defense Federal Acquisition Regulation Supplement language published recently on work measurement is not as far reaching as I would have preferred. My staff is planning two audits next year to develop a better picture of how work measurement is being used.

ESTIMATING SYSTEMS

Last fall I noted in my testimony that the Office of Federal Procurement Policy (OFPP) had objected to the promulgation of what I considered to be very useful guidelines for contractor cost estimating systems in the Federal Acquisition Regulation. Shortly thereafter, the matter was resolved and OFPP withdrew its objection. The FAR change requiring contractors to develop and maintain acceptable estimating systems as a condition of contracting has been published. Furthermore, cost estimating systems is a designated control objective in the CRAG.

TAX INFORMATION RETURNS

In 1986, the IG, DoD, and the President's Council on Integrity and Efficiency found widespread Federal agency noncompliance with Internal Revenue Code requirements for filing Form 1099 to report nonwage payments made to individuals, partnerships and medical corporations. A Federal Acquisition Regulation case had already been initiated in 1985 to require collection of necessary data--taxpayer identification numbers and taxpayer status data--to permit 1099 filing. Last September, I advised the Subcommittee that this problem remained unresolved. Since then, a revision to the acquisition regulations has been published, but more needs to be done. While provision has now been made for collection of the data by procurement offices, procedures have not been established to systematically transfer the data to the disbursing offices who file the Form 1099. My staff is following up with the Offices of the Under Secretary for Acquisition and the Comptroller to finalize this matter.

COMPLIANCE WITH WEAPON SYSTEMS DECISIONMAKING PROCEDURES

The DoD procedures for obtaining top management approval to proceed at critical weapon system development and production milestones are fundamentally sound. Historically, each Secretary of Defense has altered the process somewhat, but the basic intended feature--an orderly review of specified documentation provided by the Military Departments--remains constant. The system can only operate at maximum effectiveness, however, when weapon system proponents comply with requirements for documentation. If noncompliance is tacitly accepted or if there is confusion about what is required, there is greater risk of ill-advised decisions being made.

For the past several years we have systematically audited compliance with prescribed Defense Acquisition Board procedures and have found that there is not full compliance with the requirements for pre-decision information. Our current audit of the DAB process has resulted in four reports thus far. We are finding a continued need for more rigorous enforcement of policy and for clarification of some aspects of existing requirements.

COMPONENT BREAKOUT

At least 16 GAO and IG, DoD, audit reports issued in the last two years contained findings pertaining to inadequate breakout analyses (the desirability of breaking out weapon system components for competition). We believe there is confusion in all DoD major acquisition components on when and how to do breakout analyses. Therefore, in September 1988 I recommended to the Under Secretary for Acquisition that the guidance to the Services on the subject be expanded. In February 1989, the Deputy Assistant Secretary for Procurement responded that current guidance is adequate.

We are continuing audit efforts to develop additional data on Service component breakout performance. In addition to covering breakout during individual weapon system reviews, last month we announced an audit of the overall DoD component breakout effort.

SOURCE SELECTION PROCESS

The Subcommittee's letter asked me to discuss a number of matters related to the source selection process and other facets of the contracting process. I will start with some remarks on the types of information that should and should not be disclosed in the source selection process, the procedures for disclosure, and the remedies for improper disclosure.

-- FAR 15.409 authorizes the use of pre-proposal conferences. These conferences are held between the time a solicitation is issued and the offerors' initial proposals are submitted and afford the Government an opportunity to explain and clarify the specifications, complex terms and conditions and other requirements of a solicitation to prospective offerors. These conferences also offer the prospective offerors an opportunity to raise questions concerning the requirements of the solicitation. Subsequently, all the prospective offerors are furnished identical information related to the issues raised during the conference. Greater utilization of this type conference may be beneficial for ensuring all offerors entering a procurement do so on an equal competitive footing. Additionally, allowing sufficient time during the procurement process to ensure the information disseminated as a result of the conference is complete, accurate, and fully responsive to the questions raised may eliminate the perception that certain select offerors are receiving information not readily available to other firms.

-- FAR 15.413-1 contains the basic guidance concerning the release of information related to offerors' proposals during the source selection process. In essence, that section of the FAR precludes the dissemination of that proposal information to anyone in the public or to anyone in the Government not having a legitimate need of the information. The section further restricts any post proposal contact between the Government and the offerors to those contracting officials and technical officials who have been specifically authorized to discuss or negotiate with the offerors. The nature of any information released during the course of the discussions and negotiation of the offeror's proposals is also restricted to that which, either by itself or together with other information, may afford a prospective contractor a competitive advantage.

-- FAR 15.413-2 amplifies and extends the prohibitions related to the release of offerors' proposals in situations where the proposal is to be released outside of the Government for evaluation purposes, and sets forth the procedures for ensuring third parties involved in the proposal evaluation process accord the same protection to the information they contain as would Government officials. In general, the guidance in these two clauses is clear with respect to both the nature of releasable information and the procedures to be used in releasing the information. If followed, these clauses afford appropriate protection to the competitive process.

-- FAR 15.601 sets forth additional guidance for the conduct of negotiations and discussions during the source selection process. On one hand, this section of the FAR requires the contracting officer to fully advise an offeror of the defects in its proposal in order to afford the firm a fair opportunity to correct those deficiencies. At the same time, it directs the contracting officer and other Government officials involved in the discussions to avoid engaging in the techniques of technical leveling, (helping an offeror to bring its proposal up to the level of others by pointing out weaknesses resulting from the offeror's lack of diligence, competence or inventiveness and affording the firm repeated attempts to upgrade its offer through successive rounds of discussions), auctioning (communication of another offeror's price, its relative standing among the other offerors or a price which the offeror must meet to receive further consideration) and technical infusion (Government disclosure of information in a competing offeror's technical proposal). In our experience, the tendency is for the contracting officer to opt in favor of compliance with the direction limiting engaging in the cited prohibited practices, perhaps to the detriment of the full disclosure of the defects found in the offeror's proposal. A restructuring of the guidance in this section of the FAR may be appropriate to enhance the competitive process by ensuring that all the information needed for an offeror to correct the deficiencies in its proposal is furnished prior to the issuance of a request for best and final offers.

The question of remedies is a difficult one to assess. A number of factors such as when an improper disclosure is revealed, the urgency of the need for the item being bought, the extent to which the disclosure was knowingly made and used, the additional cost the Government will incur by a cancellation of the resulting contract, and the impact the disclosure had on the competitiveness of procurement all are factors which need to be considered in evaluating the appropriate remedy for an improper disclosure. A general formula for the remedy to be taken when an improper disclosure is revealed is therefore probably impractical. However, additional guidance is needed regarding the procedural steps to be followed to develop a remedy which appropriately considers all of those factors.

As a general comment, there is often an over emphasis on the technical aspects of the source selection process to the detriment of the business judgments involved selecting the proposal that best meets the needs of the Government. A greater emphasis on the need for sound business judgments in the source selection processs and the crucial role of the contracting officer in the rendering of the final determination is fundamentally important.

NEGOTIATION PROCESS

One of the best protections the Government has against overpricing by contractors in noncompetitive situations is the Truth in Negotiations Act. The price of a negotiated noncompetitive award may be adjusted if the Government can prove that the factual data on which the contracting officer relied were not current, accurate, and complete.

On the other hand, if all or parts of the contractor's proposal are pure estimates, the provisions of the Act do not apply. The best, and perhaps only, defense that the Government has against such inflated estimates is the skill of the Government technical people to evaluate the reasonableness of those estimates. Unfortunately, some Government technical people may not have such skills.

In addition to these protections, wider use of two step formal advertising as an alternative to fully negotiated procurements could reduce the incentives to juggle price proposals. Adoption of that alternative could also, however, prolong the procurement process adding to legitimate concerns regarding the ability of the Government to fill its requirements in a timely and efficient manner.

The regulations have already been changed to require a specific justification and approval at a level higher than the contracting officer in the event that more than one round of best and final offers is requested.

COMMERCIAL PRODUCTS AND NONDEVELOPMENTAL ITEMS

You asked that I address the removal of statutory and regulatory impediments to use of commercial buying practices and acquisition of commercial products and nondevelopmental items.

I believe that several actions can be taken to remove such impediments. Vigorous steps need to be taken to reduce the tendency to over-specify requirements. We do not need gold plated specifications for many widely available commercial products. I believe that the DoD has sufficient authority to turn the situation around, and my office will support those efforts in any way we can. The DoD Hotline has proved, for example, to be a good source of tips on overspecified items.

A recent audit of the requirements for commercial pricing certifications demonstrated that they were not needed. Commercial pricing certifications require contractors to certify that they have provided the Government the most favored customer price for noncompetitive, commercially sold spare and repair parts. Our audit found the Government obtained the most favored customer price available, whether a certificate was obtained or not.

We have found instances where contractors have improperly claimed that the product they are offering to the Government is a commercial product that is sold in substantial quantities to the general public. This is especially critical, because the requirements for the contractor to comply with the provisions of the Truth in Negotiations Act can be waived when significant commercial catalog or market priced sales exist. An audit my staff performed in 1987 found that one out of every three commercial pricing exemptions granted to contractors did not meet commerciality criteria on the basis of the sales data submitted. This was caused by contracting officers routinely accepting contractor claims for exemptions without adequate verification of the reported commercial sales data and catalog and market prices. These improper exemptions have led to substantial contract overpricing that is generally unrecoverable under existing regulations, even when the exemptions were based on wrong or misleading data. In this case, we have recommended clearer and more specific regulations to preclude further improper exemptions and contract overpricing.

The Assistant Secretary of Defense (Acquisition and Logistics) agreed with our recommendations in January 1987. The FAR revisions are still in process. Recently, the DAR Council developed proposed coverage, but my staff and the civilian agencies have not yet had an opportunity to comment on the proposed rule.

Truth In Negotiations Act

I am concerned with attempts that have been made within the Department not to apply the Truth in Negotiations Act fully. The Truth in Negotiations Act was designed to protect the Government from contract overpricing in circumstances where there is limited or no effective price competition. This is accomplished by requiring the contractor to submit for use by the Government during contract price negotiations certified cost and pricing data that is current, accurate, and complete. Most of the attempts to circumvent the use of the Truth in Negotiations Act have been built around the premise that adequate price competition exists where it does not. The Federal Acquisition Regulation permits the contracting officer to waive the requirement for certified cost and pricing data whenever he determines that "adequate price competition" exists.

"Cost realism analysis" has been one of the increasingly liberal interpretations of what constitutes "adequate price competition" that have been used with increasing frequency by contracting officers to waive the requirements of the Truth in Negotiations Act. Cost realism analysis, first pioneered by the Navy, is defined as being no more than a summary level review, normally unsupported by any certified cost and pricing data, of the cost portion of the offerors' proposals to determine if the overall cost proposed is reasonable. Given that loose definition, I am afraid that cost realism analysis can be just about anything that a contracting officer or his boss (who may be putting on the pressure to get under contract) may want it to be.

Even more disconcerting, cost realism analysis, which is being incorporated into the Defense Federal Acquisition Regulation effective May 31, 1989, defines "adequate price competition" as including circumstances where price is not a primary factor in the review of contractors' proposals. To state both that price was not a primary factor in contractor selection and at the same time to state there was adequate price competition seems to me to be contradictory and an example of convoluted thinking. This convoluted thinking has been further evidenced by a response we received to a recent draft audit report that "... Full and open competition is not a function of the number of offers solicited or received." I am at a total loss to understand how such a statement could be defended. In fact, using that logic, virtually every contract awarded could be construed as having adequate price competition.

I am concerned that the "threat of competition" argument, the incorporation of the cost realism concept into the Defense Federal Acquisition Regulation, and the overly liberal definition of what constitutes adequate price competition could lead to contract overpricing. I strongly believe that, if there is any doubt as to the adequacy (scope or degree) of price competition, it is in the Government's best interest to fully afford itself of the protections from contract overpricing provided by the Truth in Negotiations Act by requiring contractors to submit certified cost and pricing data.

REGULATORY PROCESS

Finally, Mr. Chairman, you have requested that I address the acquisition regulatory process. I would like to broaden the context somewhat and answer in terms of what I see as the need for faster, more decisive issuance of implementing guidance once laws are made. We do a disservice both to DoD personnel in the field and to contractors when we do not promulgate clear, definitive guidance expeditiously. At the present time, long delays are all too frequent, both in publishing internal DoD directives and in finalizing coverage in the Defense Federal Acquisition Regulation Supplement (DFARS) or Federal Acquisition Regulation (FAR).

It is not unusual for the development and coordination of a DoD directive, instruction or manual to take several years. Such delays are common in all functional areas, not just acquisition. While interim guidance is often provided, nevertheless the process is cumbersome and frustrating. Likewise, the formulation and coordination of DFARS and FAR changes also is a lengthy, frustrating process. An average DFARS case took 254 days in 1988 (actually down from 319 days in 1987). An average FAR case took 467 days in FY 1988 (as opposed to 415 days in FY 1987). Interestingly, coverage changes suggested by my office have taken twice as long to process as changes from other sources, even though much of the necessary staffing work for our suggestions is already accomplished before our recommendations are submitted to the DAR Council.

There are a number of reasons why the promulgation of adequate guidance is so tortuous a process. With respect to internal guidance, I believe that the Office of the Secretary of Defense could be more aggressive in insisting on prompt issuance of formal guidance. (That is also true within each Military

Department.) With respect to the acquisition regulatory process, the Regulatory Flexibility Act, the Paperwork Reduction Act, the Office of Federal Procurement Policy Act, and other applicable legislation have introduced additional complications. At some point, I hope that the DoD and the Congress can find a way to evaluate the process objectively and perhaps streamline it, as well as the enormous body of regulations it produces. In the short term, the DoD should make sure that the DAR Council is adequately staffed and is given clear direction. As a safeguard against perceptions that Council members are overly interested in safeguarding their parent agencies' prerogatives, the appraisal of their performance should be done solely by the Under Secretary of Defense for Acquisition.

As a practical matter, the DoD has had the ability to issue regulations despite challenges from the Civilian Agency Acquisition Council and the lack of a Cost Accounting Standards Board. At times the Department should be more aggressive about using such means, at least as an interim measure. The DoD is by far the primary Government procurer of goods and services by contract, and needs to be able to regulate its acquisition process, within existing law, in timely fashion. I would oppose the complete centralization of regulatory authority into a single Federal acquisition council.

CONCLUSION

Mr. Chairman, there are a myriad of tough issues confronting the DoD in the acquisition area. I have touched on some of them today. My office will continue to use our audit, inspection, investigation and analysis capabilities to identify opportunities for management improvement and will make the information we develop available to both the DoD and the Congress, in accordance with our statutory responsibilities.

I would be happy to answer any questions.

GENERAL DYNAMICS CORPORATION
Pierre Laclede Center
St. Louis, Missouri 63105

10 March 1989

Stanley C. Pace
Chairman and Chief Executive Officer

314-889-8295

The Honorable William Howard Taft IV
Acting Secretary of Defense
The Pentagon, Room 3E880
Washington, D.C. 20301

Dear Secretary Taft:

On 25 November 1988, Secretary of Defense Frank C. Carlucci, sent me a letter requesting that General Dynamics participate in the Contract Risk Assessment Guide (CRAG) initiative. After carefully studying the implications of participation, I have concluded that CRAG supports the development of strong internal controls, encourages cost reduction through elimination of duplicate reviews of contractor systems and controls, and represents a specific recommendation of the Packard Commission. Therefore, I am pleased to inform you that General Dynamics endorses the CRAG initiative and has established the implementation of CRAG as a key objective in 1989.

For the past several years General Dynamics has worked to develop and implement strong financial controls. As a result we have already implemented many of the controls recommended by CRAG. We will continue these efforts and will ensure the CRAG Control Objectives are satisfied. We are preparing to work with the Administrative Contracting Officers, the Defense Contract Audit Agency, the Defense Contract Administration Services and the Military Services by providing DEMONSTRATIONS OF THE EFFECTIVENESS OF SYSTEMS AND CONTROLS.

The opportunity for cost reduction, as outlined in Secretary Carlucci's initial memo dated 9 May, is a key factor in committing the company's support for CRAG. If properly implemented, significant cost savings will be realized by both the Department of Defense and defense contractors through direct reductions in the Department of Defense review process, elimination of duplicate reviews between Government Agencies and defense contractor personnel, fewer reviews of the same systems and controls by different Government Agencies and, indirectly by the contractors through reduced support for Government inquiries.

I encourage your continued emphasis on cost effective reviews of systems and controls, and your commitment to corresponding reductions in the Department of Defense review process for contractors that have demonstrated effective control systems. General Dynamics will support all initiatives aimed at assuring the effectiveness of contractor systems and controls which result in reduced total cost.

Sincerely,

GENERAL DYNAMICS CORPORATION

Stanley C. Pace
Chairman and
Chief Executive Officer

Senator BINGAMAN. Thank you very much.

CONSULTANTS

Let me start in this area of consultants. You indicated that there is a new guidance on management accounting and reporting of consulting services that the OMB is presently drafting, is that right?

Mr. VANDER SCHAAF. Yes. It deals with hiring of consultants internal to the Government. It is an OMB regulation called Circular A-120. Frankly, I think what they are doing to that regulation is a disgrace and a disaster, judged by the first draft I have seen of the revised version. We have been unable to deal with the definitional problem very well, so what I see happening here is a decision to define the problem away. What we are talking about, in Government terms, is something called contract advisory and assistance services. The proposed revisions to A-120 would, in my viewpoint, eliminate everything that could possibly fall under the form of assistance services. It is true that there has been a tendency for some people to want to consider certain types of assistance services, like range support services, PX management, food services, and those kind of things, as consulting; however, they are not, so we do not count them in the $3.5 billion worth of consulting service that the Department purchases.

Because we have trouble defining this thing, OMB has decided to write all of it out of the reporting process. That would be a very big mistake, in my opinion. As a matter of fact, there are so many exemptions in this new proposal that we would no longer account or keep track of federally funded R&D centers, and the consulting money going to them on a regular basis would not be reported. There are certain other exemptions also proposed. In fact, the exemptions would add up to about 95 percent of the sum between $3 and $4 billion that we report as consulting services today.

Anyway, I think a lot more work has to be done. Fortunately, there is no timetable for OMB to come out with the new revised A-120.

My office is leading a Presidential Council on Integrity and Efficiency review of the government-wide consulting process. We have strongly recommended to the Office of Federal Procurement Policy that they withhold issuing a new A-120 until we have completed this review and have a better understanding of the definitional problems and processes, and so forth, before we go ahead with a new A-120. We think doing a new A-120 at this time would be getting the cart in front of the horse.

Senator BINGAMAN. Your description of this proposed revised A-120 seems to go in just the opposite direction of what has been the general movement here in Congress, and really I think required by the public, which is to get a better handle on consulting services. Are you saying they are defining a lot of these as not being necessary for reporting purposes?

Mr. VANDER SCHAAF. Exactly. That is what would happen. I would say some 90 to 95 percent of the currently reported advisory and assistance services would no longer be reported.

Senator BINGAMAN. What is the motivation for that?

Mr. **Vander Schaaf**. Well, I think they want to write the problem away because it is such a difficult subject to deal with. There is so much controversy about it, and they believe we are having so little success in dealing with this problem. I think, however, we are having a lot more success than people realize. Defining the problem away is not going to solve anything. We are going to be right back to where we were in the late 1960s and early 1970s. Congress will demand to know how much of this is going on, and we will start the redefinition process all over again to make an assessment. I think we are nearly there without resorting to drastic measures. The A-120 needs to be cleaned up, no doubt about it, but it does not need to be gutted, which is how I see the exercise that is going on today.

Senator **Bingaman**. There are a couple of pieces, probably a lot more than a couple of pieces, of this consulting business. There are the consultants that work for the Government on the inside, as you say. There are the consultants that work for the companies that contract with the Government. You indicated your office is taking the lead in trying to come up with recommendations in these areas. Do you cover all of that? Are you talking not only about consultants to the Government, but consultants to people who contract with the Government?

Mr. **Vander Schaaf**. When I am talking A-120, I am only talking about people who consult to the Government.

Senator **Bingaman**. I know, but you also indicated that your office is heading an effort Government-wide.

Mr. **Vander Schaaf**. Well, it is not looking at the consultants who are hired by Government contractors to consult and provide advisory and assistance services to the contractor. However, the Defense Contract Audit Agency has looked at that in two major audits. The first audit covered 12 contractors in 60 locations, and the second one covered 27 contractors at 118 separate contractor locations. Again, in both of those audits, we found substantial costs incurred and passed on to the Government that are not allowable under the Government cost principles. Approximately a fourth of those costs that they audited were questioned and found to be unallowable.

Of the areas in which those costs are occurring—and I will give you examples of some of those—the ones that bother me most are certain entertainment costs which are defined as consultant costs. Another is foreign selling costs, which constantly comes up. A contractor is obviously not allowed to bill a defense contract for costs he incurs in selling his product to a foreign government. There has, however, been a lot of debate about whether or not it should be an allowable overhead cost. It is not allowable at this point in time, but it constantly comes up under the coverage, if you will, as an overhead or as a consultant cost.

The costs in dealing with executive lobbying, with legislative lobbying, and consulting type costs which are unallowable are billed to the Government. I am not talking about small dollars. The last audit that was completed in the last week or two looked at $269 million worth of consulting contracts with DOD contractors and questioned $53.7 million of that amount.

The biggest problem the auditors constantly find is a lack of documentation; there is no contract, there is no product, there is no indication of a product being delivered by the consultant. The retainer fees are often excessive.

You find a lack of internal controls in the corporations. The individual who hires the consultant negotiates the contract and sets the rate. It is all in one individual's hand within the corporation. So internal controls are bad in that aspect, as well.

I want to add that the best result of "Ill Wind," Mr. Chairman, has been to force the auditors, the Department, the IG and others to look at this consultant process in Government and what it adds to the cost of weapon systems and the cost of doing business. I think it has been very healthy. That, in itself, was probably the biggest single benefit in terms of money saving or fallout from the entire "Ill Wind" situation. However, there are others as well.

LEGISLATIVE CHANGES

Senator **Bingaman**. Are there legislative changes that you endorse to deal with this or is this a matter of better internal auditing and management of DOD?

Mr. **Vander Schaaf**. To the Department's credit, it took very straightforward action after the DCAA issued its first audit report last fall on this matter and did toughen the cost principle considerably. It is now going to be easier, at least for the auditors, to go in and identify consulting costs which are not allowable to Government contracts, and ensure that they are not put in the overhead submissions when those overhead submissions are submitted for final audit and approval and payment.

Senator **Bingaman**. Let me just be sure I understand your answer to that last question. Do you know of things that we should do legislatively here when we write the defense authorization bill this year to help ensure that there is proper oversight and proper control over this issue?

Mr. **Vander Schaaf**. No, I do not really think so—not in regard to contract consultants. With respect to the Government, yes, there are some things I would recommend. I frankly favor some type of a registration of consultants who work for the Government.

My office, for instance, goes to great lengths not to hire consultants. If we can find general advisory services somewhere else in the Government, such as medical advisory services, engineering services, and all kinds of other services, I seek those in the Government and generally have been very satisfied. But if a Government manager needs a consultant of some kind, I think it is incumbent upon the Government manager to know who else that consultant works for, what other contracts the consultant has and the nature of those contracts. Because you could in fact, be setting yourself up for a conflict of interest in providing that consultant with information of a governmental nature that would get outside of Government channels. You could get yourself into a situation where the Government has already paid for the same information in another consulting contract and end up paying for it two or three times.

Senator Pryor has been very active in working on details with respect to consultant registration, and basically I am in agreement that there needs to be some additional controls put into that side of the process. I do not think we need that, with respect to consultants hired by contractors, because the cost principles can take care of it. The Department of Defense has plenty of authority to write those cost principles in such a way that they are reasonable and effective.

ENSURING COMPLIANCE WITH ACQUISITION POLICIES

Senator **Bingaman**. Let me change subjects for a moment. You have had questions and your office has raised some serious questions about the effectiveness of the Defense Acquisition Board in terms of ensuring compliance with acquisition policies. Could you elaborate on what your present thinking is about the effectiveness of this Defense Acquisition Board?

Mr. **Vander Schaaf**. We are concerned about the delays that continually plague the process and the difficulty in getting things finished in that process. We talked about that at some length and we gave you a lot of examples last September.

Senator **Bingaman**. Right.

Mr. **Vander Schaaf**. You are talking about the Defence Acquisition Board itself and the weapon system process as opposed to the defense acquisition review process.

Senator **Bingaman**. We will get to that in a little while, too.

Mr. **Vander Schaaf**. Let me get on to the first one because that has been a long, difficult problem. Basically, the biggest single problem we have had has been lack of documentation presented to the DAB Board before a weapon system is allowed to move from a development milestone to its full-scale developmental milestone on to a production milestone. That has been an overall encompassing problem, but there have been some other problems that I think are as big and need to be addressed. Some are very difficult to deal with. They are not easy.

The big one has been what represents operational testing and how does one comply with the operational test requirements that the Congress has put in legislation. Congress has essentially said that you have to do operational tests of real weapons and vehicles in real situations, and so forth. The Department has, in a number of instances, and sometimes for what I consider good reason, come back and said we really cannot do an early operational test, however, we will give you an operational assessment.

The General Accounting Office ruled last February that operational assessments will not meet the law. So, in a sense, we are between a rock and a hard place. I will give you two examples. The SSN-21 submarine and the Navy's ultra-high frequency communication satellite, which was just recently approved for full-scale production, are perfect examples. Operational testing is very difficult, for example, on a submarine program. You cannot stop building submarines. You have built one and now it is time to go out and test it. But there is an escape clause in a sense in the legislation or the act which says you go to low-rate production.

But then you get into an issue—and this is where we have been having a great deal of problems—forcing the Department to define what constitutes low-rate production. I would say on the SSN-21, something as big and as mammoth as that, probably one a year would be low-rate production. One should not make a full-scale production decision to go ahead with the whole program or go beyond at least one a year production until you have had operational tests, or sea trials of the submarine, and its component weapon systems. That is a difficult thing to achieve. I believe the current program, or at least the program before it was revised, planned to go to two submarines next year, and three submarines in the following year. Yet we will not have had an operational test.

The satellite program is similar. You face the problem of how to do an operational test. You cannot stop producing the satellite system, but what represents a low rate buy?

Now, this really has got to be a problem for us on the C–17 aircraft. The C–17, in one particular case, the Air Force had recommended that about half of the C–17 aircraft be purchased, including advanced procurement, before operational testing is completed. Well, that clearly does not meet Congress' operational testing requirements.

So those are the kinds of big problems we face. We have got to better define what constitutes low-rate production and how do we force the system to stay at low-rate production until we actually perform operational tests.

OPERATIONAL ASSESSMENTS

Senator BINGAMAN. One of the suggestions which is heard is that we permit operational assessments rather than operational tests. In your view, does that make any sense? If so, what criteria would we be able to put in the law to see to it that the authority would not be abused?

Mr. VANDER SCHAAF. That is a difficult issue. Yes, in my viewpoint, it does make some sense in some systems to do operational assessments.

Senator BINGAMAN. Could you define the difference for me?

Mr. VANDER SCHAAF. In an operational assessment you may do some modeling. For example, you may have a prototype from which you have gotten some performance parameters set. You do some computer modeling and testing to determine if the vehicle that you are actually going to move down a production line and produce on a regular basis can, in fact, perform within that threat and meet the requirements that were originally laid down for it.

Frankly, I would prefer that we go with the full operational testing to the maximum extent possible. I think it is the safe way to go. I believe Congress says the same thing. But there are certain systems, such as high-priced satellite systems and ships, where you may have to think about amending that legislation because if you take the Comptroller General's decision of February 27, the Department will be caught between a rock and a hard place in some of those areas.

Senator BINGAMAN. Is there anything else in this area of the Defense Acquisition Board that you think we might need to try to look at doing legislatively? Do you have any problems that have been encountered there?

Mr. VANDER SCHAAF. No, I don't think so.

DEFENSE ACQUISITION REVIEW PROCESS

Senator BINGAMAN. Let's go back to the defense acquisition review process that you started to comment on.

Mr. VANDER SCHAAF. We have had a good deal of difficulty with delays in getting things done that we felt ought to be done in both internal DOD regulations and the DAR. For example, you discussed nondevelopmental and commercial procurements with the representative from the General Accounting Office, Paul Math.

I believe the Department has been working on an Instruction to address that problem for about 4 years. Maybe it takes 4 years to do that, but I do not see a lot of progress being made.

I use that as an item just because it came to our attention here, but it is just one of many.

Senator BINGAMAN. And that is bogged down in this defense acquisition review process?

Mr. VANDER SCHAAF. That one pertains to internal DOD regulations.

There is an equally serious problem concerning FAR and DFARS guidance. These are my personal opinions based to a large degree upon our audit work and the process I have seen go on for 7 years or so. I am not sure the Under Secretary for Acquisition has the kind of control of that process that he needs to have. That is one of his key levers of authority and power, to provide direction and control. If you have that policy lever, it is going to help you get things done and help you manage. If you look at the people in the process who do not work for the Under Secretary for Acquisition, but work for the service Secretaries, I think there is a tendency to debate issues long after management has decided the policy ought to be changed. We get into a lot of debates, and so forth, when we should be publishing a proposal for public comment and getting on with it, and then debating the public comment.

ACTION ON REGULATORY CHANGES

I am unsatisfied with respect to regulatory changes that our office has proposed. Since our inception about 6 years ago, we have made 42 recommendations for regulatory changes and 21 of those have been enacted. Of the 21 enacted, it takes almost twice as long to complete action on those the IG's office presents to the Defense Regulatory Council as it does to do the average one. It takes a little over 2 years on the average for one of ours; about 1 year for a typical other change. Now, they do 100 or so regulatory changes a year.

Senator BINGAMAN. The 21 that you have not had enacted, have they been turned down, or are they still pending?

Mr. VANDER SCHAAF. The 21 are still pending. Those 21 range from 4 months with the Board to 69 months with the Board. They seem to go on an awfully long time.

Senator BINGAMAN. Those 21 that are still pending, are they things that we should be aware of here in Congress so that we could urge a little faster action?

Mr. VANDER SCHAAF. Well, one of them, foreign tax credits, we brought to your attention last year. Under the current process, if a U.S. defense contractor conducts work in a foreign location, he is taxed. A foreign government taxes him. He can recover the tax in his reimbursement charge back into the contract. So it is billed and paid back. Now, we bill it back through the foreign government.

Then, he also can take a foreign tax credit. So it makes sense to want to pay foreign taxes under those rules, because you can recover them twice, in effect.

Senator BINGAMAN. Why should we not legislate an end to that?

Mr. VANDER SCHAAF. Primarily because you don't have to do it. In fact, the change has now been agreed to, I understand, but it has not been printed yet, supposedly it is about to be, but I have been waiting now for some 3 years. So, hopefully, it will be resolved.

Senator BINGAMAN. Could you give us an inventory of those that are still pending, that you have recommended there, just so we would know and be able to look at those and see if there are some which require some——

Mr. VANDER SCHAAF. I will give you a listing of the 21 and what they involve, and so forth.

Senator BINGAMAN. Thank you, that would be useful.

[The information referred to follows:]

DEFENSE ACQUISITION REGULATORY COUNCIL PROCESSING OF THE OFFICE OF THE INSPECTOR GENERAL, DEPARTMENT OF DEFENSE, REFERRALS

THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION (USD(A)) HAS NOT EXERCISED ITS AUTHORITY TO DIRECT NEEDED REGULATORY CHANGES AGREED TO WITH THE INSPECTOR GENERAL PRIOR TO REFERRAL TO THE COUNCIL. IN MANY CASES, WE PROVIDE COMPLETELY RESEARCHED AND DEVELOPED COVERAGE, SUPPORTED BY SPECIFIC REGULATORY LANGUAGE, SO THAT ALL THAT IS NEEDED IS TO PUBLISH THE PROPOSED REGULATION FOR PUBLIC COMMENT. YET, IT TAKES THE COUNCIL NEARLY TWICE AS LONG TO PROCESS AN INSPECTOR GENERAL CHANGE AS IT DOES ALL OTHER CHANGES AND THE CHANGES PROCESSED ARE OFTEN INADEQUATE AND NOT IN COMPLIANCE WITH THE AGREEMENTS REACHED.

SINCE ABOUT 1983 WE HAVE REFERRED APPROXIMATELY 42 REGULATORY CHANGES TO THE COUNCIL (ENCLOSURE A). OF THESE, 21 CASES HAVE BEEN CLOSED, TAKING FROM 6 TO 44 MONTHS TO PROCESS. DURING THE PERIODS OF FY 1987 AND FY 1988 THE DAR COUNCIL AVERAGED ABOUT 12 MONTHS TO PROCESS A DAR CASE (ENCLOSURE B). IN CONTRAST, THEY AVERAGED 23 AND 30 MONTHS FOR THE SAME PERIODS ON INSPECTOR GENERAL SPONSORED CASES. THE OVERALL AVERAGE TO-DATE FOR INSPECTOR GENERAL CASES OPEN AND CLOSED WAS 23 MONTHS. WE CURRENTLY HAVE 21 OPEN CASES BEFORE THE COUNCIL RANGING FROM 4 TO 69 MONTHS IN AGE. MANY OF THE CASES WE HAVE PROPOSED WOULD SAVE SIGNIFICANT FUNDS OR ACCORD SIGNIFICANT PROTECTION FROM CIVIL VIOLATIONS. SOME EXAMPLES OF DAR CASES INCLUDE:

- ONE CASE INVOLVED THE DOUBLE RECOVERY OF FOREIGN TAX CREDITS BY A CONTRACTOR, ONCE UNDER THE CONTRACT AND AGAIN

AS AN OFFSET AGAINST THE CONTRACTOR'S FEDERAL INCOME TAX LIABILITY. THIS CASE EMANATED FROM OUR HOTLINE WHEN A DEFENSE CONTRACT AUDIT AGENCY AUDITOR NOTIFIED US OF THE ABUSE BY A CONTRACTOR WHO WAS PERMITTED TO RECOVER AN ESTIMATED $10 MILLION OF FOREIGN TAX ON ITS DOD FOREIGN MILITARY SALE CONTRACT. THE INDUSTRY-WIDE ABUSE IN THIS AREA IS UNKNOWN BECAUSE AUDITORS WOULD NOT LIKELY PURSUE A DISALLOWANCE KNOWING THE COSTS WOULD BE ALLOWED BY THE REGULATIONS. WE TOOK IMMEDIATE STEPS TO STOP THE ABUSE BY PROPOSING A CHANGE TO THE REGULATIONS ONLY TO HAVE IT TAKE 3 YEARS TO OBTAIN THE NEEDED CHANGE IN THE REGULATION. ALTHOUGH THE COUNCIL HAS NOW APPROVED A CHANGE, IT IS STILL OPEN PENDING PROCESSING FOR PUBLICATION IN THE FEDERAL ACQUISITION REGULATIONS.

o IN ANOTHER CASE WE RECOMMENDED AND ULTIMATELY REACHED AGREEMENT WITH USD(A) FOR STRONGER CERTIFICATION OF CONTRACTORS' EQUITABLE ADJUSTMENT CLAIMS BY INCORPORATING THE NEW LANGUAGE OF THE 1986 AMENDMENT TO THE FALSE CLAIMS ACT. OUR REVIEW INDICATED THAT CONTRACTORS WERE INFLATING CLAIMS BY 60 TO 100 PERCENT. BASED ON A MINIMAL ANNUAL AUDIT VOLUME OF $500 MILLION, THE CONTRACTORS' CLAIMS COULD BE COLLECTIVELY OVERSTATED BY $300 TO $500 MILLION. NOT ONLY DO THE CLAIMS INDICATE A HIGH POTENTIAL FOR FALSE STATEMENTS, WE ESTIMATE THAT THEY WASTED IN EXCESS OF $1 MILLION ANNUALLY IN AUDIT RESOURCES. THE AUDITS BASICALLY CONSISTED OF ADJUSTING THE CLAIMS TO THE ACTUAL COSTS INCURRED BY THE CONTRACTOR AS REFLECTED IN THEIR ACCOUNTING RECORDS. THIS IS VIEWED AS "DELIBERATE IGNORANCE" OR "RECKLESS DISREGARD" OF THE TRUTH OR FACTS, AS SPECIFIED IN THE 1986 AMENDMENT. THE CASE HAS NOW BEEN AT THE COUNCIL FOR OVER A YEAR AND A HALF. IT WAS RECENTLY PUBLISHED IN THE FEDERAL REGISTER FOR PUBLIC COMMENT, BUT DID NOT USE THE 1986 AMENDMENT LANGUAGE DESPITE USD(A) AGREEMENT ON THE ACTUAL WORDING OF THE CERTIFICATE. STRONGER CERTIFICATION OF INDIRECT COST SUBMISSIONS HAD A SIGNIFICANT

EFFECT IN GETTING CONTRACTORS TO PURGE THEIR SUBMISSIONS OF UNALLOWABLE COSTS.

- AS A RESULT OF OUR REVIEWS, THE SECRETARY OF DEFENSE, IN MAY 1986, DIRECTED THAT A SERIES OF LOOPHOLES IN THE REGULATIONS REGARDING SUSPENSION AND DEBARMENT BE CLOSED. THE LOOPHOLES INVOLVED DEBARRED/SUSPENDED CONTRACTORS CONTINUING TO RECEIVE CONTRACTS BECAUSE OF DELAYS IN THE DISSEMINATION OF THE GENERAL SERVICES ADMINISTRATION DEBARRED BIDDERS LIST AND THE LACK OF GOVERNMENT-WIDE DISSEMINATION OF PROPOSED DEBARMENTS BY INDIVIDUAL AGENCIES. ALSO, DEBARMENTS WERE ONLY APPLICABLE TO PRIME CONTRACTORS SO MANY COMPANIES CONTINUED TO RECEIVE SUBCONTRACTS. DESPITE THE SECRETARY'S DIRECTION TO CLOSE THE LOOPHOLES, THE MATTER WAS SIMPLY SENT TO THE DAR COUNCIL FOR THEIR CONSIDERATION. THE COUNCIL RECEIVED THE FIRST OF OUR PROPOSED CHANGES IN NOVEMBER 1985 AND STILL A FINAL RULE HAS NOT BEEN ISSUED OVER 3 YEARS LATER.

WE HAVE MANY MORE EXAMPLES OF THE COUNCIL'S DELAYS AND LACK OF COMPLIANCE WITH AGREED TO CHANGES. BUT LET ME MAKE CLEAR THAT THE CONDITION WOULD ONLY BE WORSE IF THE FUNCTION WAS TURNED OVER TO THE CIVILIAN ACQUISITION COUNCIL. IT WOULD ADD ADDITIONAL TIME TO THE PROCESS AND EVEN LESS RESPONSIVENESS TO OUR PROPOSED CHANGES. WHAT IS NEEDED, IS FOR THE USD(A) TO SIMPLY HONOR THE AGREEMENTS REACHED AND TO DIRECT THE COUNCIL TO IMPLEMENT THE AGREEMENTS IN A GIVEN TIMEFRAME. THE USD(A) HAS THE AUTHORITY AND SIMPLY NEEDS TO EXERCISE IT.

STATUS REPORT ON
INSPECTOR GENERAL DAR CASES
AS OF APRIL 30, 1989

Chart

o Summary of Cases Referred Since 1983 1

o Description of Cases by Item Number 2

o Aging of Cases 3

o Average Age of Cases Closed in FY 1987 4

o Average Age of Cases Closed in FY 1988 5

SUMMARY OF INSPECTOR GENERAL CASES REFERRED

SINCE 1983

ITEM NO.	IG REPORT NO	DAR CASE NO	AIG	NUMBER RECOM	REFERRAL DATE (NOTE A)	CLOSING OR CURRENT DATE	MONTHS LAPSED
1	86-123	85-241	AUD	6	9/04/86	4/30/89	32
2	86-023	87-77	AUD	1	1/27/86	11/01/88	34
3	86-023	85-55	AUD	1	1/27/86	5/10/88	28
4	87-140	88008	AUD	1	7/27/87	4/30/89	21
5	88-143	88-28	AUD	1	8/29/88	4/30/89	8
6	85-071	87-03	AUD	1	4/17/85	12/05/88	44
7	87-017	84-196	AUD	1	11/04/86	4/30/89	30
8	87-210	85-37	AUD	4	11/24/87	4/30/89	17
9	88-163	87-097	AUD	1	12/23/88	4/30/89	4
10	83-137	86-2	AUD	1	9/12/83	4/30/89	65
11	86-062	84-202	AUD	1	9/25/87	4/30/89	19
12	83-142	86-64	AUD	2	9/30/83	3/20/87	42
13	85-081	87-5	AUD	1	7/25/85	6/16/87	23
14	86-069	86-173	AUD	1	5/13/86	3/15/87	10
15	85-120	85-10	AUD	1	1/24/86	9/30/86	8
16	83-058	82-69	AUD	3	5/02/83	12/20/85	32
17	84-125	84-76	AUD	1	12/11/84	5/02/86	17
18	84-010	82-61	AUD	1	3/01/84	9/30/85	19
19	84-010	82-61	AUD	1	3/01/84	2/25/85	12
20	84-010	82-61	AUD	1	3/01/84	12/20/84	10
21	84-109	85-27	AUD	2	10/28/84	8/29/86	22
22	87-005	85-102	INS	1	8/24/87	4/30/89	21
23	87-005	86-121	INS	1	2/24/87	9/01/87	6
24	85-002	85-102	INS	1	7/24/85	10/31/86	15
25	87-003	87-128	APO	3	9/24/87	4/30/89	19

CONTINUED ON PAGE 2

Explanatory Notes

A. Includes all known IG cases from FY 1983 forward, based on IG report recommendations or formal referrals. Referral dates are the dates agreement was reached on a report recommendation or the date of a resolution document. For formal referrals, the date of the referring document was used. A case may appear more than once if the date of referral or closing is different for individual recommendations.

B. These two cases are applicable to Cost Accounting Standards issues involving cost impact proposals and overpayments to contractors. The ASD(P&L) agreed to draft FAR coverage for the DAR Council. Case numbers have not yet been assigned.

C. These three cases involve recovery of overpayments. The Civilian Acquisition Council has challenged an ASD(P&L) draft of a proposed FAR change. Case numbers have not yet been assigned.

CHART 1
Page 1 of 2

SUMMARY OF INSPECTOR GENERAL CASES REFERRED

SINCE 1983

ITEM NO.	IG REPORT NO	DAR CASE NO	AIG	NUMBER RECOM	REFERRAL DATE (NOTE A)	CLOSING OR CURRENT DATE	MONTHS LAPSED
26	85-018	84-96	APO	1	2/24/86	6/25/87	16
27	86-005	86-109	APO	1	7/16/86	3/15/88	20
28	86-001	86-14	APO	1	12/20/85	1/11/88	25
29	N/A	86-20	APO	1	2/01/86	4/30/89	39
30	N/A	84-192	APO	1	11/01/84	7/28/86	21
31	N/A	85-284	APO	1	11/01/85	4/30/89	43
32	N/A	85-222	APO	1	8/01/85	4/10/87	20
33	N/A	86-25	APO	1	2/01/86	4/30/89	39
34	N/A	86-157	APO	1	8/01/84	11/28/87	40
35	AFU1	Note B	AFU	1	10/07/87	4/30/89	19
36	AFU2	Note B	AFU	1	10/07/87	4/30/89	19
37	AFU3	85-223	AFU	1	10/07/87	4/30/89	19
38	AFU4	85-223	AFU	1	10/07/87	4/30/89	19
39	AFU5	Note C	AFU	1	10/07/87	4/30/89	19
40	AFU6	Note C	AFU	1	10/07/87	4/30/89	19
41	AFU7	Note C	AFU	1	10/07/87	4/30/89	19
42	AFU8	84-96	AFU	1	7/17/87	4/30/89	22
						Average	23

CHART 1
Page 2 of 2

INSPECTOR GENERAL CASES REFERRED TO DEFENSE ACQUSITION REGULATORY COUNCIL

ITEM NUMBER DESCRIPTION

1. Special Tooling
2. Brand Name Description
3. Subcontract Competition Reporting
4. Expansion of Contract Administration Office Functions
5. Certification of Necessity for GFP
6. Overhead Cost Allocation
7. IRS Contract Payments Reportable
8. Cost Pricing Data, Claim for Exemption, SF 1112
9. Adequate Price Competition
10. Safety and Occupational Health
11. OFPP PL 84-1 and FFROC, FY87, Sec 912
12. Progress Payment, Administration Subcontractors
13. Advanced Deliveries, Limits on Acceptance of
14. P-3C Aircraft - Acquisition and Modifications
15. Standard Form 0024, Bid Bond
16. Precious Metals Recovery Program
17. Security Costs at Contractor Plants
18. Sole Source Justif. for Noncomp. ADP Support Ser. Procure.
19. Sole Source Justif. for Noncomp. ADP Support Ser. Procure.
20. Sole Source Justif. for Noncomp. ADP Support Ser. Procure.
21. DoDIG PL. 85-804 Prop Doc Changes
22. Arms, Ammo & Explosives at Contractor Facilities
23. V-E Program Requirements
24. Arms, Ammo & Explosives at Contractor Facilities
25. Equitable Adjustment Claims
26. Audit Independence
27. Estimating System Reviews
28. Contractor's Operations
29. Double Recovery of Foreign Taxes
30. Access to Contractor Records
31. Affiliates Definition-Debarments/Suspension
32. Prohibition of Hiring Felons
33. Debarment and Suspension
34. Self-Governance/DoD Hotline
35. Overpayments Due to CAS Noncompliance
36. CAS Impact Proposals Have Est. for Interest Due on the Principal
37. Overpayments on Contracts Resulting from Defective Pricing
38. Overpayments Due to Defective Pricing
39. Demands for Payment When Overpayments Have Been Made
40. Demands for Payment be Extended to Credit Invoices
41. Adjustments Made to Contracts for Settlements Amt. to Deferments
42. Subcontractors, Review of Proposed Contractor Costs

CHART 2
Page 1 of 1

AGING OF INSPECTOR GENERAL CASES
REFERRED TO
DEFENSE ACQUISITION REGULATORY COUNCIL

RECOMMENDATIONS FOR FAR/DFAR CHANGES	0-6Ms	7-12Ms	13-18Ms	19-24Ms	25-30Ms	31-36Ms	37-42Ms	43-48Ms	49-60Ms	60+Ms	Tota
AUDIT	1	5	2	5	2	3	1	1	0	1	21
INSPECTIONS	1		1	1							3
APO			1	4	1		3	1			10
FOLLOWUP				8							8
Total IG	2	5	4	18	3	3	4	2	0	1	42

Percent of IG Referrals Open After One Year	83% (35/42)
Percent of IG Referrals Open After Two Years	31% (13/42)
Percent of IG Referrals Open After Three Years	17% (7/42)
Percent of IG Referrals Open After Five Years	2% (1/42)

CHART 3
Page 1 of 1

INSPECTOR GENERAL CASES CLOSED IN 1987

ITEM NO.	IG REPORT NO	DAR CASE NO	AIG	NUMBER RECOM	REFERRAL DATE (NOTE A)	CLOSING OR CURRENT DATE	MONTHS LAPSED
12	83-142	86-64	AUD	2	9/30/83	3/20/87	42
13	85-081	87-5	AUD	1	7/25/85	6/18/87	23
14	86-009	86-173	AUD	1	5/13/86	3/15/87	10
23	87-005	86-121	INS	1	2/24/87	9/01/87	6
26	85-010	84-96	APO	1	2/24/86	6/25/87	16
32	N/A	85-222	APO	1	9/01/85	4/10/87	20
34	N/A	86-157	APO	1	8/01/84	11/28/87	40
						Average	23

CHART 4
Page 1 of 1

INSPECTOR GENERAL CASES CLOSED IN 1988

ITEM NO.	IG REPORT NO	DAR CASE NO	AIG	NUMBER RECOM	REFERRAL DATE (NOTE A)	CLOSING OR CURRENT DATE	MONTHS LAPSED
2	86-023	87-77	AUD	1	1/27/86	11/01/88	34
3	86-023	85-55	AUD	1	1/27/86	5/18/88	2[illegible]
6	85-071	87-03	AUD	1	4/17/85	12/05/88	14
27	86-005	86-109	APO	1	7/16/86	3/15/88	2[illegible]
28	86-001	86-14	APO	1	12/20/85	1/11/88	[illegible]3
						AVERAGE	3[illegible]

CHART 5
Page 1 of 1

CASE PROCESSING - A PERSPECTIVE

	DAR DAYS	NOW:
o NUMBER OF CASES:	140	250
o STATUTORY DEADLINES:	FEW-NONE	36 in 1988
o REGULATORY DEVELOPMENT:	DAR COUNCIL SUBCOMMITTEE DAR COUNCIL DAR STAFF	DAR COUNCIL SUBCOMMITTEE DAR COUNCIL CAA COUNCIL PUBLIC COMMENTS DAR COUNCIL SUBCOMMITTEE DAR COUNCIL CAA COUNCIL FAR SECRETARIAT SIGNATURE FEDERAL REGISTER
o PRODUCT:	COVERAGE	COVERAGE FEDERAL REGISTER NOTICE PAPERWORK REDUCTION ACT REGULATORY FLEXIBILITY ACT
o SIGNATURE:	DoD	DoD/NASA/GSA

CASE WORKLOAD

1987	DFARS	FAR	TOTAL
Opened	134	112	246
Closed	162	146	308
Average Age (Days)	319	415	365
1988			
Opened	140	152	292
Closed	159	186	345
Average Age (Days)	254	467	368

- Since most cases are considered more than once, the Council reviews over 1000 cases per year

ACTIVE CASES AS OF MARCH 25

AT DARC	97
AT CAAC	62
PUBLIC COMMENT	17
TO BE PUBLISHED	32
TOTAL	208

batch published every 30 days

CASE WORKLOAD - PRIORITY 1 CASES

1987	DFARS	FAR	TOTAL
Opened	36	8	44
Closed	40	15	55
Average Age (Days)	351	480	386
1988			
Opened	48	46	94
Closed	49	31	80
Average Age (Days)	159	202	175

DEARS CASE PROCESSING TIME – NORMAL CASE

DAYS	ACTION
	Case received
7	DARC opens case
7	Case manager assigns case to committee
7	Distributed to committee members
30	Committee report due to case manager
7	Committee report to DARC
14	DARC discusses case
7	Proposed rule to Federal Register
5	Proposed rule published
60	Public comment period closes
7	Public comments to DARC
7	Case manager assigns cmnts to committee
7	Comments distributed to committee members
30	Cmte report on final rule due to case manager
7	Final rule to DARC
14	DARC approves final rule
7	Final rule ready for DAC
30	DAC to DASD(P) for signature
3	DAC to printer
30	DAC rec'd thru distribution – Case closed

287 Days Total Case Processing Time

add 100 days
for FAR cases.

DESCRIPTION OF CASES: DAR CASE STATUS REPORT, AS OF APRIL 30, 1989

1. Special Tooling
Ensure that contracting officers perform timely retention analysis prior to transferring special tooling to post-production storage contracts and discontinue no-cost storage agreements.

4. Expansion of Contract Administration Office Functions
Prohibit payment of fee or profit on the portion of contracts under which facilities are acquired.

5. Certification of Necessity for GFP
Prohibit contractor acquired "other plant equipment" unless expressly approved in advance and identified in the contract.

7. IRS Contract Payments Reporting
Require procurement documents, specifically small purchases, to contain the information necessary to prepare Form 1099.

8. Cost/Pricing Data, Claim for Exemption, SF 1412
Revise Standard Form 1412, "Claim for Exemption From Submission of Certified Cost or Pricing Data, "to include an actual certification of the accuracy, currency, and completeness of the sales data. Recognize that contracting officers do not have authority to wave cost and pricing data submission when items do not qualify for exemption. Require contracting officers to document the data relied on for exemptions.

9. Adequate Price Competition
Obtain certified cost or pricing data when the award is split between offerors. Clarify the policy for soliciting and awarding contracts for dual-source acquisitions. Issue a dual-source policy on cost benefit analysis and for monitoring and controlling dual-source procurement costs.

10. Safety and Occupational Health
Obtain material safety data sheets at time of bid or make the data sheets a deliverable item in contracts.

11. OFPP PL 84-1 and FFROC, FY87, Sec 912
Issue policy on the levels and uses of contractor's reserve funds; DOD's rights to assets of FCRC's and not-for-profit contractors; and interest on investment of reserves to be considered in fee awards.

22. Arms, Ammo & Explosives at Contractor Facilities
Require procurement commands to coordinate security and safety issues prior to finalizing sensitive contracts.

25. Equitable Adjustment Claims
Implement stronger certification of claims using the new False Claims Act language. Make FAR 52.243-6 clause mandatory for all contracts to ensure segregation of cost of constructive changes.

29. Double Recovery of Foreign Taxes
Require contractors to reimburse the U.S. Treasury when foreign tax credits are claimed against their Federal Income Tax liability and also on their FMS contract.

31. Affiliates Definition-Debarments/Suspension
Clarify the definition of "Affiliates" in FAR 9.403. This referral was rolled over into Item Number 33 below.

33. Debarment and Suspension
Close loopholes in the regulations that permit debarred/suspended contractors/subcontractors to receive awards.

35. Overpayment Due to CAS Noncompliance
Issue instructions on overpayments made because of a Cost Accounting Standards noncompliance and assess interest due.

36. CAS Impact Proposals Have Est. for Interest Due on the Principal
Require that cost impact proposals separately estimate interests due on principal.

37. Overpayments on Contracts Resulting from Defective Pricing
Require that credit for overpayments due to defective pricing on contracts awarded prior to November 8, 1985 be sought in accordance with FAR 32.6.

38. Overpayment Due to Defective Pricing
Providing guidance on overpayments resulting from defective pricing and the calculation of interest due.

39. Demands for Payment When Overpayments Have Been Made
Require demands for payment be issued when overpayments have been made.

40. Demands for Payment be Extended to Credit Invoices
Require demands for payment of debts be extended to credit invoices.

41. Adjustments to Contracts

Revise FAR/DFARS stating that it is improper to adjust contracts other than those affected by the defective pricing or CAS noncompliance.

42. Subcontractors, Review of Proposed Contractor Costs

Require contracting officers, during negotiation of prime, contracts, to determine the effect on price of adverse opinion audit reports on subcontractor proposals.

THE OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE,
PRODUCTION AND LOGISTICS, P/DARS,
Washington, DC, July 5, 1989.

MEMORANDUM FOR DEPUTY INSPECTOR GENERAL

Subject: Audit Resolution Agreements Involving Changes to the Acquisition Regulations.

At your request, I have reviewed our policy regarding audit resolution agreements involving changes to the Federal Acquisition Regulation and the Defense Federal Acquisition Regulation Supplement.

I agree that, when there is an audit resolution agreement on specific FAR or DFARS language, the DAR Council will be directed to implement the agreed upon language subject to the legal requirement for consideration of public comment and coordination with agencies outside DOD, such as NASA, GSA, and OFPP. In instances where public comment or the required coordination with non-DOD agencies result in changes to the agreed upon coverage, we will renegotiate our resolution with the IG before publishing a final rule.

I have directed the Director to the DAR council to treat these audit resolution agreements as Priority 1 cases, and to implement them as expeditiously as possible.

I am extremely distressed by IG comments that the DAR Council has disregarded direction from me, the USD(A), or the Secretary in developing changes to the acquisition regulations. I know of no instance where this has occurred, and I view such remarks as performing an extreme disservice to the Council and the Department. In particular, on cases involving work measurement systems, suspension and debarment, and exemptions to cost and pricing data, statements that the DAR Council thwarted DOD management are simply untrue. I request that you take whatever steps are needed to correct the record on these cases and ensure that such misstatements do not occur in the future.

ELEANOR R. SPECTOR,
Deputy Assistant Secretary of
Defense for Procurement.

INSPECTOR GENERAL,
DEPARTMENT OF DEFENSE,
Arlington, VA, July 18, 1989.

MEMORANDUM FOR DEPUTY ASSISTANT SECRETARY OF DEFENSE (PROCUREMENT), OASD (P&L)

Subject: Audit Resolution Agreements Involving Changes to the Acquisition Regulations.

Thank you for your July 6, 1989 memorandum on the above subject. Your directing the Defense Acquisition Regulatory (DAR) Council to make and give priority treatment to Inspector General changes to the Defense Federal Acquisition Regulation Supplement (DFARS) will resolve many of the frustrations we experienced in getting changes made to the regulations. Your prompt response is appreciated. There is, however, one area of your response that needs clarification to resolve the matter completely and ensure harmony with the Council on future changes. The area is the renegotiation of the agreed-to changes as a result of non-DOD agencies coordination and public comments.

The Inspector General recommended changes to the regulations are to correct conditions found in DOD operations and, therefore, are not always appliable to non-DOD agencies. For this reason, our recommendations are for changes to the DFARS, not the Federal Acquisition Regulation (FAR). Changes to the DFARS are clearly a matter under your authority. While I appreciate the Council's objective of having a single set of regulations, to the maximum extent possible, and have no objections to considering comments from the non-DOD agencies, I do not believe their objections to the agreed-to changes are grounds to renegotiate our agreement.

Regarding public comments, they too should not be grounds for renegotiating the agreements. As with the non-DOD agencies comments, we will be glad to consider the public comments to the extent they disclose issues that warrant revision to the agreements. However, the mere fact that a member of the public comments negatively to the agreed-to change does not mean the change is not needed to protect DOD interests. It would be a rare case when the public, particularly a private industry respondent, does not comment negatively to more stringent regulations. I believe that the basis of our recommendations, to correct fraud, waste and abuse conditions, will more than outweigh the public objections.

I am afraid that we are simply going to have to agree to disagree on the Council's work with respect to their not taking appropriate action on certain key IG recommendations, such as suspension and debarment of subcontractors and the use of modern work measurement techniques in negotiating contracts and evaluating contractor performance. I know that I personally and the entire Inspector General organization, believed that we had an understanding based on Secretary of Defense direction that our recommendations would be adopted. Despite Secretary of Defense direction, it took several years to obtain a satisfactory rule in the suspension/debarment of subcontractors and we still have not achieved a satisfactory rule on the application of engineered labor standards in the negotiation and pricing of major Defense contracts.

Again, thank you for your prompt response to put this matter behind us. I believe your direction to the DAR Council will make for a much improved relationship between our respective organizations and enable the DAR Council to carry out its mission with far less disruption. The work of the DAR Council is critical to the effectiveness of the DOD acquisition mission, and the members of the Council deserve much credit for the job they do with an overwhelming workload.

Please let me know if you disagree with or wish to discuss my position on the treatment of comments on the agreed-to changes. We are willing to consider, in the spirit of cooperation, any legitimate improvement or corrections to the agreed-to changes revealed by the comments that are in the best interest of DOD.

DEREK J. VANDER SCHAAF,
Deputy Inspector General.

COMPONENT BREAKOUT

Senator BINGAMAN. Let me ask on another subject, component breakout. Evidently there is a considerable disagreement between your office and some in the acquisition policy arena on procedures for analyzing the desirability of breakout weapon system components for competition. Could you elaborate on the status of that disagreement and where things are?

Mr. VANDER SCHAAF. We believe there are two fundamental deficiencies with the breakout guidance or the breakout policy that is now used. First, there is a lack of clarity as to when or under what procurement strategies a breakout analysis is required, and conversely, what procurement approaches should exempt a program manager from having to perform a breakout analysis of his particular procurement or weapon system.

And second, the current guidelines are unclear as to how a breakout analysis ought to be done, what amount of documentation is required to support a breakout or no breakout decision, and so forth. There is not anything in the regulation with respect to the procedures or what ought to be done, and so forth.

We have looked at 18 weapon systems, where we felt they were amenable to breakout analysis at least, and have been unable to find any that really have a breakout analysis performed on them. Reasons for not performing a breakout analysis range from "we will do it", or "we should not do it in this case because it is a multi-year procurement", or "we bought this missile system as an all-up round, this is an integrated process and we would lose warranty rights if we tried to break it out." Those may all be good reasons, but we think the regulations ought to tell a program manager when he ought to do a breakout analysis and how that breakout analysis ought to be performed.

I have discussed this many times with Ms. Spector, who handles a lot of the procurement regulation issues in the Department, and she keeps coming back, saying well, factors other than costs are important. We say we agree completely, but put in the regulation what evaluation criteria you want other than cost, so we can audit and look at it, and see if it is reasonable or not, and have an analysis done on whether it makes sense to do some breakout. In many cases, we think breakout can save the Government a considerable amount of money, and it just seems to be very difficult to get it done.

WORK MEASUREMENT

Senator BINGAMAN. This area of work measurement is another subject you raise in your testimony, noting significant problems with the way the Department writes its rules on work measurement. Could you give me some examples of what the problem is there, what needs to be done, and what, if anything, the Congress can do to get this matter cleaned up?

Mr. VANDER SCHAAF. Congress tried to deal with this issue in about 1985, and passed a law that was not very helpful in our opinion. If you recall, at that point, I testified before two or three congressional committees and said your law is not good, it is not workable, please revoke or repeal the law, and let the Department deal with the matter of work measurement. The Department, at that time Secretary Weinberger, had made a commitment that he would put into effect rules requiring contractors who had a contract in excess of $10 million, to have some type of a work measurement standard in the facility that applied engineered labor standards, to be applied to the production process. We have, to date, never really achieved that regulation. We have a regulation, but it is pretty much back to where it was. It is not mandatory, it is voluntary. It does not do the job. But what we like about work measurement is the potential it offers for finding a better way to award contractors, if you will, profit incentives and so forth. I think that altogether too much of defense contracting is built around selling costs to the Government. If your costs are higher, the opportunities to make a bigger profit are bigger because much of what you are measuring is against incurred costs.

On the other side, in the commercial world, you have a so-called market price. If you can get very efficient and reduce your production costs, and maintain your market price, you can enhance your profits greatly.

In the DOD business, for the most part, if you improve your efficiency, reduce your production costs substantially, and the Government comes along and takes away the enhancement by reducing your price, you therefore reduce your profit.

So we think that if we can use this work measurement process as a base along with some other measures of the indirect labor and how firms organize and otherwise manage their work force to get the work done, we can get ourselves into a position where we can change the profit policy to emphasize productivity, not costs. That is why we are so anxious to see defense contractors and the Defense Department get more to a system that helps the Department measure productivity and which can reward productive contractors better. That is really what is behind the whole issue from our standpoint, but we have just been very unsuccessful in getting them to adopt that kind of an approach to profit policy.

I have an interesting paper we wrote on that issue and I would like to put that paper in your record and you can take a look at it and see what you think of it.

Senator BINGAMAN. We would be pleased to have it.

Mr. VANDER SCHAAF. It is 20 pages long and it discusses this in considerably more detail than I can sit here and talk to you about it.

Senator BINGAMAN. I would be very glad to have that for our record.

[The information follows:]

Department of Defense, Inspector General Viewpoint on Government Industry Relationships and Strategies to Encourage Contractors to Cut Costs

This paper presents the Office of the Inspector General, Department of Defense (OIG, DoD) review and recommendations for ongoing cost reduction incentive programs and proposal of a new management strategy. The paper was one of several prepared in response to the President's request for a review of management practices and recommendations that would contribute to more effective operation and management of the Department of Defense.

The Office of the Inspector General has reviewed Government-Industry relationships looking for ways to encourage contractors to cut costs. In our opinion, the defense acquisition environment is far too focused on profit that is, in turn, based on justifying costs. Existing regulations set Government and industry against each other as profit is primarily based on justifying costs. This paper proposes a new management strategy directed at changing the Government and industry cost/profit environment. The Department's profit policy needs to be revamped in ways that tie profit (return on investment) to efficiency, productivity, and quality.

THE DEFENSE ACQUISITION ENVIRONMENT

A prime area of contention between Government and industry is the justification of the fairness and reasonableness of costs and the determination of profits. The source of what are sometimes referred to as adversarial relationships between Government and contractors is often the defense acquisition environment itself. The environment includes large budgets, one buyer (monopsony) or few buyers (oligopsony), commodities controlled by a few producers (oligopoly) or one producer (monopoly), and regulations that focus on cost justification as the basis for profits.

There are many significant differences in the environments of commercial and defense acquisition. One of the significant differences is pricing. In the commercial environment, the market generally sets the price. Contractors determine their entry into a market and their profits by the extent to which their cost to produce is lower than the market determined price. The defense environment presents a sharp contrast. In the defense environment, contractors increase their profits by increasing the amount of costs they can justify to the Government.

Defense acquisition regulations currently encourage the contractor "to sell" the Government costs. The more costs a contractor can justify, the more profit a contractor can earn. Inflated costs not only provide benefits of increased revenue flow, but also an enlarged base for profit calculation. Profit tends to be calculated as a percentage of the costs incurred.

Productivity is encouraged by the commercial environment itself. In the commercial environment the greater the productivity, the lower the cost, the greater the profit. The defense environment does not, ipso facto, encourage productivity. In the defense environment the real situation is often that the greater the productivity, the lower the cost, the lower the profit. Thus, other strategies must be used to encourage increased productivity and lower costs. Several strategies aimed at encouraging contractors to reduce costs have been proposed and implemented, with varying degrees of success. The strategies tried include work measurement systems, should cost analyses, competition. value engineering, multiyear procurement, and weighted guidelines.

A NEW STRATEGY PROPOSAL TO ENCOURAGE CONTRACTORS TO CUT COSTS

The strategies described later in this paper have, to date, been aimed more at the symptoms of the cost cutting issue between Government and industry and have met with limited success. We believe that the issue requires a new game plan, a strategy aimed at the cause of the issue.

We propose moving the Government procurement focus away from buying costs to focus instead on identifying and rewarding productivity. The strategy would entail an annual sampling of contractors' direct manufacturing labor productivity to establish an annual average. An index would be constructed that would assign profit as a function of the extent to which an individual contractor's actual direct manufacturing labor productivity was above or below the average. In other words, each contractor's profit would be based on its manufacturing direct labor productivity relative to that of the defense industry as a whole. The mechanism for implementing such a system would include:

> A comprehensive, repeatable, fair, and credible approach for assessing manufacturing direct labor productivity. The approach must include three all-encompassing elements of manufacturing direct labor productivity: direct labor utilization, methods and operations, and loading (overhead, general and administrative, and profit).
>
> A productivity index based on an annual statistical sample of Defense contractors direct labor productivity.

A profit scale based on the productivity index, combined with a legislative change to the profit limits.

A calculation of each contractor's productivity using the specifically defined approach.

Establish an estimated profit for each contract based on where the contractors productivity fits on the overall defense productivity scale.

We believe that this approach can lead to a defense acquisition environment more akin to the commercial environment, where productivity plays an important role in determining profits.

Such an approach could also improve Government/industry relationships by reducing the conflict over cost justification, the current basis for profit calculation. The significance of the Government and industry relationship was stressed in the Packard Commission report A Quest for Excellence (pg 75).

> Our study of Defense management compels us to conclude that nothing merits greater concern than the increasingly troubled relationship between the defense industry and Government.

Each Defense contractor would be in competition with every other Defense contractor in terms of productivity and opportunity to earn resultant profit. Profit would be closely tied to productivity.

Other potential benefits include:

> A more predictable profit policy, eliminating profit negotiation differences between Military Department and between negotiators within Military Department.
>
> The opportunity to fail, an important motivator. If a contractor is inefficient, its profit would be greatly reduced, perhaps even to zero.
>
> Risk would still be recognized by the type of contract awarded.

We realize that our proposal embodies a major change in the defense acquisition environment, in fact a change in the defense culture. We further realize that it would take time to work out specific implementing plans, mechanisms, language, and actions. However, the necessity of such a strategy is apparent. We need to get at the cause of the cost, productivity, and Government/industry relationship issues rather than continue to address just the symptoms.

Some of the approaches used, to varying degrees, such as work measurement, and should cost, could be used in conjunction with this concept. However, many of the current "strategies" used to cut costs need to be strengthened as explained in the following pages.

ONGOING STRATEGIES TO CUT COSTS

WORK MEASUREMENT SYSTEMS

In 1986, the IG, DOD, conducted the most comprehensive study to date of work measurement systems and engineered labor standards (Appendix A). We did not find a single work measurement system that was not cost effective. We concluded that there is a vast potential for improving direct labor utilization in contractor operations through more vigorous application of work measurement systems and engineered labor standards. Expanded use of work measurement holds exciting possibilities for driving down overall costs, identifying contractors that make efficient use of labor and rewarding them accordingly. The report recommended that DoD establish a policy requiring work measurement systems based on engineered labor standards for certain prime and subcontracts. The recommendations contained specific contracting officer and contractor responsibilities, accuracy criteria for the engineered labor standards, requirements for revisions to Military Standard 1567A, and specialized training programs.

In May 1987, Secretary Weinberger advised Senator Charles E. Grassley that "most if not all" of our recommendations would be adopted (Appendix B). In November 1987, the GAO issued a report endorsing our conclusions and recommendations (Appendix C). The DoD again responded that implementing Defense Acquisition Regulations (DAR) Council actions were under way. Unfortunately, proposed Defense Federal Acquisition Regulations Supplement (DFARS) language was not published until August 1988, and we found the proposed language to be seriously inadequate and not in accordance with the previous DoD commitments on the subject (Appendix D).

We recommend a DoD-wide policy to capture the benefits of engineered labor standard based on work measurement systems and resultant corrective actions. Our recommendation keeps in mind the complexities of weapon systems acquisitions and ongoing efforts, such as streamlining, by emphasizing what is necessary for contractors to do and leaving the execution details to the contractors themselves.

We recommend the policy should apply to: prime production contracts of $20 million or more or a projected succession of prime contracts of $100 million or more cumulatively; any subcontracts of such a prime contractor having a projected succession of subcontracts of $25 million or more; and whenever the level of competition present is such that cost or pricing data are required or requested.

Each contractor submitting a proposal for a contract covered by the policy would include in the proposal the standard hours of work content based on engineered labor standards and the realization factors used to convert from engineered labor standards to proposed labor hours.

The contracting officer would analyze the standard hours of work content and the realization factors in establishing the Government cost objective for touch labor and document the analysis in the Price Negotiation Memorandum. Those contractors showing low realization factors would have a opportunity to earn additional profits or incentive awards. Our original report on this subject contains recommendations and guidelines for revising Military Standard 1567A to put in place effective work measurement programs.

SHOULD COST

Should cost evaluations are detailed analyses of a contractors operation conducted by a team of Government experts and are provided to DoD procurring activities as a tool for use in price negotiations. They consist not only of an indepth cost analysis, but also an analysis of what the costs "should" be if identified inefficiencies were corrected. The analyses include engineering analysis, associated drawings review, and detailed reviews of all related cost elements which, together, represent an independent estimate of what an item should cost.

In a report (Appendix E) issued in September 1985, we found that when used, should cost analyses were an effective tool in reducing contractors proposed prices. We found, however, there were inadequacies in DoD should cost policy that resulted in under-utilization of the should cost concept. The existing policy gave too much latitude to the Military Departments in determining when to use should cost analyses. There was not an effective Office of the Secretary of Defense (OSD) level monitor for the implementation of a should cost policy. Additionally, when should cost analyses were done, they did not sufficiently emphasize key high cost areas such as overhead and subcontracting. We found that use of should cost could lead to a potential reduction of $6.9 billion over the remaining production life of 10 major programs that had not been subject to a should cost analysis.

We recommended that OSD revise its policy to require that the Military Departments perform at least one should cost analysis early in the production cycle for each major program and better define the conditions that identify the applicability of those pricing techniques. The recommendations were implemented through changes to the Federal Acquisition Regulation and the DoD Supplement. Congress also passed legislation that closely paralleled our should cost audit recommendation. In addition, the Deputy Secretary of Defense directed that each Military Service perform two should cost reviews of overhead at major contractor operations during calendar year 1986.

The above improvements notwithstanding, we believe that there is still room for significant savings if should cost analyses were more rigorously applied, both in terms of challenging exceptions to conducting them and in terms of thoroughness and completeness of the analyses themselves.

COMPETITION

The Competition in Contracting Act of 1984 (CICA) was enacted to promote the use of competitive procurement procedures and to limit the Government reliance on sole source negotiated contracts. The law, as implemented in the Federal Acquisition Regulation (FAR), requires acquisition managers to obtain full and open competition to the maximum extent practicable. The DoD has reported significant increases in the use of competitive contracting procedures. In terms of acquisition dollars, the percentage of competitive actions DoD reported were 42.9 in FY 1984, 48.3 in FY 1985, 57.2 in FY 1986, and 60.3 in FY 1987.

We have taken an indepth look at the procurements that were purported to be competitive to determine if adequate price competition did in fact exist. We found that the zeal to increase the level of competition has sometimes had the unfortunate side effect of allowing contractors to be inappropriately exempted from the requirement to submit certified cost or pricing data, as described in the FAR and in the Truth in Negotiations Act, through increasingly liberal interpretations of what constitutes "adequate price competition."

For example, a recent audit (Appendix F) showed that adequate price competition did not exist for many dual-sourced procurements. Dual-sourcing is a procurement technique where two or more sources respond to a Government solicitation for a total requirement that is intended to be split among the sources, with the larger share usually going to the lower priced supplier. We found that usually one contractor had a decided competitive advantage over the other, and that both contractors usually knew before they made their offers that they would split the contract award--factors that definitely limited competition and placed the Government at risk of not obtaining a fair and reasonable price. We reviewed 38 dual-sourced procurements and found that adequate price competition did not exist for 30 of the procurements valued at $8.8 billion. We believe dual-sourcing is of value to the Government. However, its use does not guarantee adequate price competition or automatically justify elimination of the Government requirements for insight into the contractor's costs.

Another recent audit (Appendix G) revealed numerous procurements that were classified as competitive where little or no effective price competition existed. Effective competition, as defined in the FAR, is a market condition that exists when two or more contractors, acting independently, actively contend for the Government business in a manner which ensures that the Government will be offered the lowest cost or price alternative or best technical design meeting its minimum needs. An increasingly large percentage of the DoD procurement budget is being spent on "competitively awarded" contracts where effective competition may not exist.

The Government has also pursued competition in the form of procuring nondevelopmental or commercial items. The DoD has effectively implemented commercial product initiatives in its directives and regulations. However, the Government needs to ensure that it is paying fair and reasonable prices. Certification of commercial pricing in some instances provides the Government with such assurance. In other instances, it does not. For example, when a DoD procurement is so large that it creates an oligopsony, a situation where each of a few buyers exerts disproportionate influence on the market, reliance on commercial, competitive market forces to set fair and reasonable prices becomes questionable.

For both competitive and sole source awards, contracting officers have the right and the obligation to ensure that contract prices are fair and reasonable. Where adequate price competition exists, according to the FAR criteria, quality is a mandatory evaluation factor in every negotiated competitive source selection. One of the key measures of quality is past performance.

We recommend that new mechanism be developed to measure and report on quality. We recommend that contracting officers be required to include an evaluation of the past performance of each offeror in the competitive range as part of cost realism analysis. Previously negotiated and current actual labor rates, overhead, rates, and productivity indicators, such as realization factors, should be obtained from other contracting officers having current or recently completed contracts with the offerors.

We recommend that DoD continue its efforts to expand competition. But DoD must also realize that meeting the technical definition of competition does not always ensure fair and reasonable prices. We recommend that DoD tighten its regulations defining adequate price competition. We recommend that guidance be improved for the type, rigor, and documentation of price analyses when dual-sourcing or commercial pricing is the basis for competition. We further recommend that component breakout be combined with competition. Such a combination can result in greater savings to the Government than competition alone.

VALUE ENGINEERING

As defined in the Office of Management and Budget Circular

No. A-131, value engineering is:

> An organized effort directed by a person trained in value engineering techniques to analyze the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life cycle cost consistent with required performance, reliability, quality and safety.

We found in our audit "Management of Value Engineering Change Proposals (VECP)" (Appendix B) that although top level management emphasis has been given to the program, there has been little substantive improvement at the contracting officer level, where the success of the program is ultimately determined. VECPs were treated as low priority in competing for resources in procurement and contract administration activities. We found in 1984, for example, the DoD was $375 million or 57 percent below it savings goal. We further found that responsible procurement activities were not evaluating and processing VECPs in a timely manner. A number of special inquiries into the handling of particular value engineering proposals provided further evidence that the program was not afforded the resources and attention it deserved.

Since 1984, the DoD reported significantly increased VECP results. For example, $1.5 billion was reported for the FY 1986-1988 period.

We recommend that value engineering be given continuing emphasis.

MULTIYEAR CONTRACTING

The DoD began using multiyear contracting for major weapon systems in FY 1982. According to the Comptroller of the DoD, between FY 1982 and 1989, 58 programs were congressionally approved for multiyear contracting with projected multiyear savings of about $8.8 billion. About 33 percent of the savings were reportedly achieved under three programs: B-1B, F-16, and M1 tank.

The Packard Commission recommended in June 1986 that Congress approve multiyear funding for all major programs approved for full-scale development to achieve greater program stability and lower unit prices. The Secretary of Defense has recommended that 32 programs be considered for multiyear contracting in FYs 1990 through 1994.

Properly planned and effectively managed, multiyear contracting can result in increased program stability and lower costs. Procurement planning is critical. Component breakout and competition must not be ignored. Breakout of components coupled with procurement of larger lots would yield larger savings than only a multiyear arrangement with a prime contractor.

We recommend that a should cost analysis, including direct labor productivity (direct labor utilization, methods and operations, and loading), be required prior to, and form the price base of, multiyear contracts.

WEIGHTED GUIDELINES PROFIT POLICY

The DoD final profit policy rule was issued on August 3, 1987 to replace an interim profit policy that had been in effect since October 1986. The new profit policy resulted from a financial and investment review (1985) conducted by DoD which showed that Defense contractors return on assets (ROA) was greater than comparable durable goods manufacturers ROA during the 1980-1983 period.

One of the major goals of the interim draft policy was to reduce the overall profit negotiated on Defense contracts by one percent. The DoD goal to reduce overall negotiated profit objectives was based on an assumption that a reduction in negotiation profit objectives would have a corresponding downward affect on actual profits received on Defense contracts.

The DoD final profit policy rule expressly took into account the contractor's degree of performance risk in producing the goods or services being acquired, the contract type risk assumed by the contractor under varied contract and incentive arrangements, and the nature and extent of facilities capital to be employed by the contractor. The final rule also established normal values and designated ranges for each profit factor and specified that practices which produce an arbitrary profit objective or accomplish a profit analysis on an after-the-fact basis were unacceptable.

Our on-going audit (Appendix I contains a copy of a survey debrief) of profit policy indicates that DoD contracting officials are assigning higher weights to contractor performance risk factors to which they are also assigning the highest permitted profit values, using their own judgement. The contracting officers often assign above normal values to weighted values. Profit values assigned by the contracting officers are not always within designated ranges, nor are they properly justified. Further, contracting officers are not fully using available audit and technical resources for assigning profit values.

We recommend that the policy be modified so that weights assigned for particular contracts will be based on more empirical data rather than relying so heavily on contracting officers' judgement. We recommend that contracting officers be required to document thoroughly their analyses and justification of the applied weights. We recommend that contracting officers be properly trained and supervised in their assignment of weights. They must thoroughly understand both the process of assigning weights and the DoD objectives for the application of the process.

Finally, if further audit verification demonstrates that the Weighted Guideline Method is essentially a paper exercise, we will recommend scrapping the weighted guideline process.

CONTRACTOR RISK ASSESSMENT GUIDE

Senator BINGAMAN. You discussed in your testimony progress on implementing the Contractor Risk Assessment Guide and the problems that have kept contractors from signing up. Do we need to legislate mandatory reports by contractors on internal controls such as this? What is your thought as to the problem in this area?

Mr. VANDER SCHAAF. No, I would say you do not need to legislate. I think these programs have to remain voluntary in order to be effective. If mandatory, they will become checklists; there will be a checklist mentality added to them.

It has to be an interoperative process between the administrative contracting officer in our major facilities and the Defense Contract Audit Agency where they work together; where the contractor shows that he has good internal controls and good management systems in certain aspects of his operation; and where we in the Government back off from pressing detailed oversight, review, and audit of those areas where the contractor can demonstrate good internal controls. We would reduce our coverage in those areas.

It has to be an interactive process. It cannot be a mandatory "thou shall do" checklist. I do not think this would work well. I think we are much better off in winning the confidence of the defense industry, for them to participate in this program, and for each company to come along and work out its own role.

Some companies may want to work with some aspects of their production process, others their cost estimating system, their labor measurement, their overhead system, their material management system, or whatever it is. They may not want to work on other management aspects right away, and they ought to have the opportunity to select that on their own. As soon as you mandate it, you are going to have to say, "you shall have this," and "you shall have that."

Senator **Bingaman**. Taking your advice, if we do not mandate it, how do we get more contractors to sign up?

Mr. **Vander Schaaf**. I think we will get contractors to participate as they become a little more secure and feel better about it. I think Mr. Stan Pace, head of General Dynamics, in the letter I put in my statement, sets the right tone. I think he is serious about it. At least I believe he is serious about it. Therefore, let us give it a try as a voluntary approach first.

You know, there was a recommendation 6 or 8 months ago that there should be a mandatory disclosure program. This came from the Defense Science Board. I believe that Secretary Carlucci really said you have to have a mandatory ethics program, of which an element is the voluntary disclosure agreement. Well, to me that sets the whole thing in a wrong direction and the Department has, in fact, decided at least to put on hold the decision to make a contractor have a mandatory ethics program. It is currently a voluntary kind of approach. It does not set the requirements of what constitutes a proper ethics program.

SUSPENSION OF SUBCONTRACTORS

Senator **Bingaman**. The suspension of subcontractors was an issue you raised very forcefully in the hearing we had last fall. I gather from your testimony today that progress has been made there. What is the situation now? Progress has been made but we still do not have a rule. Is that right?

Mr. **Vander Schaaf**. I guess we do not. They tell me all it is, is a matter of printing it. We are satisfied with the rule and we think it was absolutely essential. The rule says that if you have been suspended or debarred from doing work directly for the Government, you cannot do work as a subcontractor without extremely good reasons. The prime contractor who hires you as a subcontractor must report to the contracting officer the reasons why it is necessary to deal with this suspended or debarred subcontractor.

We would have liked that to go down another tier where certain subcontractors cannot deal with suspended or debarred contractors, as well, but it would take a long time to get that through, and we are happy. At least we are down to the second tier with this process now. So if you get suspended and debarred from the Federal Government, you are going to have a much harder time doing work. You are going to have to get down at least to a second tier before you can work for the Government. But I think it is just a matter of printing that one and it is behind us, so that is some progress.

REVOLVING DOOR ISSUE

Senator **Bingaman**. Regarding the revolving door issue, we continue to hear complaints that the statute and the rules that have been proposed to implement the statute are still inadequte, that we have a significant problem with competent people not wanting to come into Government, of not being willing to by virtue of what has been done in that area. Do you have any thoughts on this problem?

Mr. **Vander Schaaf**. Yes. I wish it were a little less complex and I wish the regulations and the laws were a little easier to understand and were not so difficult to interpret. I think the administration has at least made a very valiant effort to fix that problem. As you know, the President appointed the special commission which looked at this problem of ethics in Government in general, and the revolving door in particular. The President has now submitted legislation and obviously, we think that legislation will be helpful in getting rid of some of the overlap.

I frankly support all that legislation which is on the books. I do not see the legislation as being too restrictive or otherwise hurting people or interfering with people's willingness to come into Government, and so forth. I think you have to take steps to ensure public confidence in the procurement process and that is what it does. The other thing you have to do is prevent people from coming into the Government solely to increase their employment potential or their marketability as a result of spending a short period in Government. There are a lot of people who want to come into Government for 2 years, have a ticket punched, and then be a lot more marketable at a much higher price somewhere else. Maybe that is fine in a sense, but when you become marketable with somebody who you negotiated or awarded a contract with, or audited a contract for, then you have a problem. I will put our own organization in that same boat. You should not be working for a firm in which you personally and substantially were involved in that kind of a situation.

The current laws are not that restrictive. Now, the new one goes into effect tomorrow. Again, I support that OFPP Act for the most part. Is everything perfect in it? No, but basically it leans in the right direction.

We recently finished a review, Mr. Chairman, of a senior official who served as a source selection authority on a contract. Now, this contract turned out to be a very large, important contract in that the contractor became a second source for a major weapon. The award was made and that company now has a nitch in a market that it had not been in before. It had not made the particular item that was contracted for. This source selection official made the decision.

Now, under the current law—we are still waiting for some more legal interpretations, but I am quite sure that the lawyers are right—he did not participate in the negotiation process, but he made the final decision. Well, the individual happened to go to work for the company that became the second source. Now, I do not have any reason to believe there was anything wrong with the award of that contract or that the decision was tainted, et cetera, but it has potential perception problems.

What I am trying to illustrate here is people complain that these laws are terribly restrictive, when they are not totally restrictive. For most people in Government who deal with contractors, they deal with a few contractors in a substantial and personal way, and they have plenty of opportunity to go out and work for contractors where they did not get personally involved in the direct negotiation of a contract or the settlement of a claim, or decision to purchase more items off a contractor.

So all in all, I think the laws need to be cleaned up. The President has proposed doing that. I hope that Congress will support cleaning up those laws, and I am for keeping them relatively tough.

CONTRACTOR INVENTORY SYSTEM

Senator BINGAMAN. The contractor inventory system is something that I think you have been very critical of in the way that the Department has proposed implementation of the legislation governing that area. Do you have any suggestions for things we need to do in this area to be sure that something useful is done here?

Mr. VANDER SCHAAF. Yes. Congress addressed the issue last year and it apparently did not turn out very well. Let me explain to you, first of all, that this is a big issue, it is a serious matter, and it involves lots of dollars.

Currently, we have about 196 contractors where material management and accounting systems—or MRP systems as they are called—are in place and use those kinds of ADP-controlled management systems. We have either recommended for withholding, or are withholding, or the contractors are voluntarily withholding some $292 million right now in this area. To date we have made one-time progress payment withholdings of some $220 million. We are talking about systems which, if they are not properly operated, can cause the Government to take a real bath, and they can cost a large amount of money. You can end up paying for something twice and you can end up paying for far more than it really costs. You can get things that are purchased for commercial sales to Government contracts, and so forth.

We have found plenty of problems in these MRP systems. Our answer to this we think is relatively simple. Our answer is have the contractor or senior official certify that their system meets the requirements and guidelines that are laid down. I, in fact, have reworked the certification again to try to do this. Congress, after a number of hours of hearings on the House side, told the Defense Department to go back and write appropriate certification requirements.

Well, the Department interpreted the word appropriate in front of certification to mean no certification. I do not know how you can reach that interpretation if you read the debate on the issue and you look at the work that has been done by both our office and the Defense Contract Audit Agency.

The big problem I have is with putting the burden of this on our contracting administration officers, rather than putting the burden on the companies that manage and operate these accounting systems. Every time we try to do this, Mr. Chairman, we get back a reply that it is going to cost us millions of dollars to certify that these systems are right, and there is no need for it because they are all right.

There is a basic inconsistency in the position that the industry has taken on this. If it is going to cost millions of dollars to fix these things, then they are not all right. I would like to have somebody certify either that they are all right or they are not all right, so we know where to do our audit work in this process.

You know, if corporate executives are uneasy and feel that they cannot certify, then I do not see why the taxpayer, the Government, or anybody else should say, well, we are happy with the system and you do not have to certify that it works.

It has been a long running battle, I will not bore you with it. I have got a lot of detail on it. I hope that Congress looks at that issue again this year and, if necessary, forces a certification on the Department in this area. I will be happy to put in your record a draft, one which I think would be perfectly appropriate, usable, and prove to be useful.

Senator BINGAMAN. Yes, please do that.

[The information follows:]

CERTIFICATION OF MATERIAL MANAGEMENT
AND
ACCOUNTING SYSTEMS

This is to certify that to the best of my knowledge and belief:

1. ______________________________ has installed and operates a Material Management and
(Name of Firm)
Accounting System or an equivalent system referred to as ______________________________,
herein after referred to as "the system."

2. The system, as installed and operating as of ______________, has been thoroughly reviewed, evaluated, and otherwise tested by ______________________________.
(Internal Auditors, External Auditors, Consultants, etc.)

3. The tests included assessments of software and hardware security, internal accounting and administrative controls, operating policies and associated corporate policies, and actual and hypothetical transactions.

4. The results of the tests have demonstrated that the system maintains data integrity and yields equitable results.

5. The details of all specific tests and all test results are documented in corporate files. Those files will be retained for a period of at least 5 years from the date of this certification and will be available upon request to Department of Defense officials for copying, review, evaluation, scrutiny and testing.

6. The tests will be updated or repeated ______________________ by
(Specify Period)
____.
(Internal Auditors, External Auditors, Consultants, etc.)

7. The system is acceptable for controlling Government property and for Government contract costing purposes, the requirements for which are set forth in the Federal Acquisition Regulations, the Cost Accounting Standards (as applicable), and other pertinent statutes and regulations.

I declare under penalty of perjury that the foregoing is true and correct.

Firm: ______________________________

Signature: ______________________________

Name of Corporate Official: ______________________________

Title: ______________________________

Date of Execution: ______________________________

[This certificate is to be executed by an individual of the contractor's organization at a level no lower than a vice president or chief financial officer of the business segment using the material management and accounting system. This certificate must be executed by all contractors using a material management and accounting system if such contractors have at least one contract with the Department of Defense for an amount in excess of $10,000,000 (including options and modifications). Failure to execute this certificate may result in the suspension or reduction of progress payments.]

MICROMANAGEMENT

Senator BINGAMAN. I think we on the Senate side probably deserve some of the criticism in this scenario. I think the House did have a proposal for a fairly specific requirement there written into the law, but in the interests of trying to back away a little bit from micromanagement, which we are always accused of, I think our view was that we should give the Department a little bit of discretion. Your testimony is that that was a mistake.

Mr. VANDER SCHAAF. No, I do not think that was a mistake at all. I think you were right to give the Department the discretion. I think the policy issue is, should there be certification, and Congress answered the policy issue, yes, there should be certification. What ought to be the nature of that certification is probably getting into a detail that Congress does not have to get into, and the answer to that is go out and do appropriate certification. Those were your words, but it did not work.

Senator BINGAMAN. Does the proposal you are submitting for the record actually tell them how to do it?

Mr. VANDER SCHAAF. You bet.

Senator BINGAMAN. And it does not give them that discretion?

Mr. VANDER SCHAAF. You would have to decide. That is nothing for us to determine. I can give you a form of what I think is an appropriate certification and how you would put that into law or into direction or report, or how you would use it. At least it would give you and your staff something to look at in terms of what might be appropriate.

REGULATORY REFORM

Senator BINGAMAN. On another topic regarding the whole issue of regulatory reform in the Department, we have been trying to urge the Department to develop a means to manage the regulatory reform process. We called on the Department to establish evaluation criteria, timetables, and to try to implement changes that they thought were appropriate from the regulatory simplification programs.

Based on this 1988 report that we received, I have real concerns about whether or not the Department has established the criteria and management tools that they need in this area. If you have any thoughts on this, I would be anxious to hear them as to how we move this process forward.

Mr. VANDER SCHAAF. Mr. Math expressed the matter well. Let me say I endorse Mr. Math's and the GAO's sentiments.

The law said the Under Secretary of Defense for Acquisition shall submit to Congress a report on the current programs of the Under Secretary regarding simplification of procedures governing the acquisition process of the Department of Defense. The report should include a timetable to effectively regulate reform measures based on lessons learned, a methodology to use in evaluating such programs, and a timetable for completing an assessment of the results of the program, and so forth.

The Department's report—and it has some very good aspects—certainly did not cover those parts at all and, therefore, it is very difficult for Congress to take away legislation or to add legislation without good analysis. I think that is something we can help the Department do through our audit process. That is what, to a large degree, auditing is. It is a form of analysis. If we can be useful and helpful, I would be most willing to work with the new Under Secretary for Acquisition on trying to help him with the problem of figuring out which of these rules and regulations are useful and which are not useful, as we see them, and try to put some economic measures behind them.

Let me add one other point that comes to mind that I think is relevant to this. It is this business about keeping the Government away, not having the Government auditor interfere in private business, et cetera. There was a little bit of that philosophy applied to the savings and loans business. The Government ought to keep hands off and stay back, and let the savings and loan industry do its thing.

Well, it comes back and bites you a little bit. I am just saying let us get some good analysis on these things and then decide whether we need more coverage, less coverage, et cetera. Like the GAO said, just do not react to it automatically because defense industry doesn't like a law or regulation.

ORGANIZATIONAL STRUCTURE

Senator **Bingaman**. The Packard Commission recommended that in the organizational structure of the Department that we needed to give greater authority to program managers and take away some of the interference. Do you think that that has happened? Is there any evidence that you are aware of that program managers are in a better position to call the shots and resist outside interference than before the restructuring of the Department that we tried to engage in here? Is that a problem we still need to look at, or is that one that we have fixed?

Mr. **Vander Schaaf**. I do not know if there has been a lot changed. I am not sure. I think the program manager probably has an adequate amount of authority within his own program office. I think he still has to brief his program and have his program approved by far too many layers of management between him and the officials that ultimately decide what happens to his program.

The new system is supposed to have two layers of management between the program manager and the Under Secretary of Defense for Acquisition. We have attempted to do that. We put those two layers in there, but I am not sure we have taken away the other layers that are there. The systems commands are still there and the subsystems commands, if you will, the special buying commands and management commands. I am not convinced from what I have seen that those organizations have really gotten out of the program manager's hair or given authority to make appropriate financial and programmatic kinds of decisions to the program manager, or the resource decisions, and so forth.

I do not think the Packard Commission's organizational changes have really done a great deal from what we have seen to date. The recommendations have been adopted. The right people, the program manager is there; the next layer, the program executive and the service procurement executive is there. I don't think having the procurement executive for a military department be the Secretary of that service or the deputy or Under Secretary of that service, is a good idea. That certainly does not give him a lot of time to manage these programs. I believe the Navy has done that.

Senator **Bingaman**. They do not today, do they?

Mr. **Vander Schaaf**. I do not know. Did they change that?

Senator **Bingaman**. It is the Under Secretary I am told.

Mr. **Vander Schaaf**. I think that ought to be a separate person, an acquisition executive within the service, if we are going to continue with that kind of an organizational management. But for the most part, the new structure has been put in place, but I am not sure it has really changed the process a whole lot.

Senator **Bingaman**. Thank you very much. We may have other questions that we will submit to you in writing. I think your testimony has been very valuable. I think it will give us some things to think about as we try to prepare our legislation for this year. Again, thank you very much.

[Questions for the record with answers supplied follow:]

Questions Submitted by Senator Jeff Bingaman

ACQUISITION REFORM PRIORITY ISSUES

Senator **Bingaman**. What advice would you give the new Under Secretary of Defense for Acquisition in terms of identifying priority issues that should be emphasized within each of the following four areas:

a. Organization of DOD's acquisition process;
b. Acquisition personnel policies;
c. Reform of major weapons system acquisition policies; and
d. Regulation and oversight of contractor activities.

Organization of DOD's acquisition process

Mr. **Math**. The new Under Secretary's overriding priority must be on restoring faith and integrity in the acquisition process. Also, the new Under Secretary must show a strong, continuing commitment to ensure that reform initiatives bring about meaningful change. To do this, the Under Secretary must bring some structure and discipline into the reform process. The Under Secretary should develop a means for assessing progress, aggressively following up, and implementing lessons learned.

Acquisition personnel policies

Improving the acquisition workforce certainly must be high on the new Under Secretary's priority list. We have long advocated the need to strengthen the capabilities of program managers and contracting officers. Collectively, these personnel are responsible for spending billions of dollars.

DOD has made progress in this area, but much remains to be done. An acquisition workforce of high quality and integrity and with sound qualifications and experience is vital to the defense acquisition workforce.

Reform of major weapons system acquisition policies

DOD weapons system acquisition policies are essentially sound. What is needed is time for recent reform measures to take hold. For example, the acquisition organization changes made in response to the Packard Commission should be given time to work. But, DOD management must continue to place emphasis in this area to ensure the changes achieve the centralized policy-making and decentralized implementation intended by the changes.

Regulations and oversight of contractor activities

DOD cannot afford to audit each and every transaction. The first line of defense in controlling fraud, waste, and abuse is an adequate control system supported at the highest level in the company. We strongly believe the new Under Secretary should encourage self-governance. Accountability and responsibility for compliance with procurement laws and regulations must rest with the contractor. Vigilant oversight is needed to encourage and ensure contractors institute needed internal control measures.

LEGISLATIVE PROPOSALS PENDING ACTION

Senator BINGAMAN. Your testimony is quite critical of DOD's failure to provide any substantive analysis to support the legislative proposals listed in the December 1988 report. Based upon your own review of the acquisition process, are there any proposals in the DOD report that can be acted on at this time, or do the proposals require further justification, study, and analysis?

Mr. MATH. We have not conducted an evaluation of each legislative change advocated in DOD's report. Moreover, the comprehensive analysis required of DOD by the 1989 Defense Authorization Act is necessary before any decisions can be reached about changing or eliminating existing laws.

However, based on our cursory review, one of the proposals seems to have merit. DOD would like to amend the law to provide an extension of time that an appropriation is available for obligation if the appropriation would expire during the pendency of a bid protest. We believe that funds to be used to carry out agency programs should not be lost because of delays in making contract awards due to bid protests. Therefore, we would support DOD's proposed change.

ORGANIZATIONAL STRUCTURE

Senator BINGAMAN. Your testimony notes that DOD has established the organization structure recommended by the Packard Commission, but you expressed concern as to whether the officials in the structure have the decision-making authority envisioned by the Commission. Could you give us some examples to illustrate this problem, particularly in terms of the location of decision-making authority?

Mr. MATH. As previously discussed, the Navy and Air Force implemented the Packard Commission's recommendations by "dual-hatting" officials such as systems and product division commanders with PEO responsibilities. Although the PEOs can now communicate directly with the Service Acquisition Executive, their authority and control over acquisition matters remains essentially unchanged. On the other hand, the Army created new positions for its PEOs and placed them and their program managers outside the traditional chain of command. However, the traditional chain retained control over the PEO and program manager's resources. For example, the Air Force appointed a Service Acquisition Executive as recommended by the Commission but retained decision-making authority over resources within the corporate Air Force structure—primarily by the Commander of the Air Force Systems Command and the Air Staff.

PROBLEMS FACING NEW LEADERSHIP

Senator BINGAMAN. As the Department examines its own implementation of the Packard structure, what are some of the specific problems and issues that need to be addressed by the new leadership?

Mr. MATH. As noted above, we recently completed field work on Senator Roth's request and are now analyzing the collected data. Our preliminary observations indicate that the services have not fully met the Commission's objectives. However, until we complete our analysis, we cannot identify the changes needed to fully implement the Commission's recommendations. In June 1989, we provided detailed recommendations to the Secretaries of the Navy and Air Force to centralize their acquisition responsibilities with their respective Service Acquisition Executive. Our ongoing study should be completed in the September/October 1989 timeframe.

DEFENSE ISSUES

Senator BINGAMAN. In your Transition Series document titled "Defense Issues," you state that congressionally required Selected Acquisition Reports (SARs), which are intended to provide data on the status of major weapon programs, have become subjected to many revisions voluminous and somewhat difficult to understand. You recommend that the SARs be revamped. It is our understanding that the Service and OSD are working on revisions to the SARs. Do you have any more specific recommendations on this matter, including comments on the following:

a. Should we try to combine other congressionally required information/documents with the SAR, such as Unit Cost Reports, Unit Costs Exception Reports, Baselines, Congressional Data Sheets, etc.;

b. Should changes be across the board for all SAR programs, or for some subset of programs; and

c. Should we urge the new administration to reduce internal reporting requirements, and use the new reformatted SAR as the primary program report for both Congress and OSD.

Mr. **Math**. Over the years, we have reported on changes needed to improve selected acquisition reporting. Our current evaluation of the SAR suggests that DOD acquisition reporting should be reformatted, modernized, and include more explicit cost, schedule, and delivery information. The revised report should include the best attributes of the Defense Acquisition Executive Summary (DAES) and the SAR in one consolidated report.

We believe the timeliness, usefulness, and presentation of SAR data can be significantly improved. Specifically, DOD could combine its information requirements into a single automated data base and consolidate several acquisition reports for senior DOD management officials and Congress. Weapons system status reports generated from the same data base used to manage those programs would enhance confidence in the information reported to Congress.

Senior DOD acquisition executives have indicated that actions are underway to improve acquisition reporting.

INTERNAL ACQUISITION REPORTS

Senator **Bingaman**. At the present time OSD's acquisition reporting system is fragmented. The Under Secretary's Comptroller provides the SAR; staff provides internal acquisition reports called DAES. Should these functions be combined and managed by the Under Secretary of Defense for Acquisition?

Mr. **Math**. We believe that DOD acquisition reports, both internal and external, should be generated from a single data base managed by the Under Secretary of Defense, Acquisition. Currently, the Defense Acquisition Executive produces the DAES. This report provides status information on SAR programs that are more concise, informative, and understandable than the SAR. Over the years the SAR has not been modernized or significantly improved under the DOD Comptroller.

ACQUISITION REFORM PRIORITY ISSUES

Senator **Bingaman**. Within each of the following areas, please identify any specific issues that should be given priority attention in terms of acquisition reform:

a. Organization of DOD acquisition process;

b. Acquisition personnel policies;

c. Reform of major weapons system acquisition policies; and

d. Regulation and oversight of contractor activities.

Mr. **Vander Schaaf**. In terms of *organizing the DOD acquisition process*, I agree with the General Accounting Office testimony that more needs to be done to streamline the process and reduce the number of players and layers. Technically, a program manager is supposed to have considerable autonomy and authority at his/her level, and there should only be two layers of officials between the program manager and the USD(A). In practice, I doubt whether the program manager is reasonably unfettered, and I am sure that DOD contracting officers are constantly directed, contacted, guided, and influenced by a multitude of officials. Priority attention ought to be given to the following:

—Making a concerted effort to *enforce* acquisition policy. Merely establishing policy is not enough. If DOD policy is to streamline the acquisition process, then prompt implementation action must be demanded and actively monitored.

—Truly supervising the acquisition effort. The USD(A) should be the principal player in allocating resources for research, development, and procurement. He/she should actively manage the acquisition apparatus, having considerable control over program content, scheduling, pricing, and administration.

—Ensuring that Service Acquisition Executives (SAE) have no significant non-acquisition duties. The Secretary or Under Secretary of a Military Department can devote no more than a fraction of his time to acquisition matters, and that is not enough.

—Reevaluating the need for each layer now existing in the Military Department acquisition structures. Do we need both systems commands and field level commands, plus large headquarters elements?

—Completing the consolidation of DOD contract administration organizations. Secretary McNamara's attempt to centralize the contract administration function in the 1960s succeeded only partially. If the job were completed, the USD(A) would find it easier to supervise the acquisition process and many of the problems of duplicate oversight could be more effectively addressed.

In the area of *personnel policies*, I support the following:

—Stop the brain drain caused by military retirees being forced into the private sector and grant much greater waiver authority so that the DOD can hire these talented people as civilian employees without penalizing them.

—Push alternative civilian personnel systems, along the lines of the China Lake experiment.

—Implement an "acquisition corps" concept, preferably DOD-wide, but at least Service-wide.

—Emphasize proper training and treat acquisition personnel as professionals. Give them more authority, but increased accountability as well. Reduce organizational layering and other impediments to performance and morale.

Concerning the *major weapons system acquisition process,* I offer these suggestions:

—Put more discipline into the process, insisting on the provision of full, timely documentation to decisionmakers.

—Do not allow programs to pass through Milestones II and III until it is completely evident that they meet the basic operational requirements.

—Avoid decisions entailing "low rate production" merely as a device to avoid admitting that full rate production is being started on an item before testing is complete.

—Emphasize early testing and prototyping.

—Be more careful when validating full production capability with acceptable quality control.

—Accept genuinely low rate production until realistic operational test and evaluation is conducted.

On the matter of *regulation and oversight of contractor activities,* I recommend:

—A review be undertaken by USD(A) to determine if the increased authorities given to administrative contracting officers for oversight of DOD visitors have been effective in reducing unnecessary and duplicate visits to contractors' facilities.

—Priority be given to the completion of the planned reviews of selected oversight functions and that, based on the results of the reviews, appropriate policy guidance be issued to address the duplicate oversight matter. The OIG, DOD, stands ready to participate actively in that effort.

—The Contractor Risk Assessment Guide and Voluntary Disclosure Program be strongly endorsed by Congress, so that contractors are encouraged to participate.

ILL WIND SCANDAL

Senator BINGAMAN. What are the basic lessons you would draw from the information that has been made public to date about the "Ill Wind" procurement scandal?

Mr. VANDER SCHAAF. In my opinion, the most basic lesson learned from "Ill Wind" is the need to improve internal controls regarding the use of consultants in the acquisition process. I expect the ongoing Government-wide reviews on contract advisory and assistance services and audits on contractor employment of consultants to result in numerous additional recommendations for improving management of consultants. (Those recommendations stemming from the first phase of the reviews were discussed in Ms. Brown's September 1988 testimony.) It is already clear that Government agencies need an effective mechanism for identifying who else consultants work for and the nature of the products they provide. With respect to consultants working for contractors, the DOD should fully implement a revised cost principle to curtail the allowability of many kinds of consultant service costs on contracts that have been "disguised" as other kinds of costs.

Government and industry must make it clear that unethical behavior will not be tolerated, whether it is by ones own employees or by someone under contract. Despite all the allegations made about too many DOD auditors and investigators, the fact is that criminal elements exist who have no scruples about bribery of Government officials and misuse of proprietary contractual data. Perhaps these unfortunate events will illustrate why effective oversight of the billions of dollars worth of DOD procurements is essential if the taxpayers and honest contractors are to be adequately protected.

LEGISLATIVE CHANGES NEEDED

Senator BINGAMAN. Are there specific legislative changes needed at this time or should further changes await developments in the investigation and prosecutions?

Mr. VANDER SCHAAF. The types of improvements needed in the acquisition regulations and in Government/industry internal controls could be achieved through voluntary action without legislation. I think that Congress has made it quite clear, however, that it will step in with legislation if action by either the DOD or industry lags.

Congressional action is urgently needed, however, to clarify, simplify, and make more uniform in application post-employment restrictions and other, ethics-related matters. As mentioned in my statement, I strongly endorse the thrust of the President's legislative proposals in that area.

NEW GUIDANCE ON MANAGEMENT

Senator **BINGAMAN**. Your testimony notes that you are participating in the development of new guidance on management, accounting, and reporting of consulting services. What should be included in that guidance to ensure that important govern mental functions, such as the development of sources selection criteria and the conduct of the source selection process, will be controlled by government officials?

Mr. **VANDER SCHAAF**. Services performed by contractors should be intermittent as required in Circular A-120 of January 4, 1988. If services are not intermittent, approval for continued services should be required from the Service acquisition executive. The approval for continued services should not be delegated below this level. Our current audit on consultants is showing a continued reliance on the same contractor to provide the same services over a lengthy period of time. When continued reliance is anticipated, the activity should be required to make substantive efforts to develop in-house capabilities, develop alternative contractor sources for these services, or exclude the contractor from bidding on the follow-on effort.

CONSULTANTS' CONFLICTS OF INTEREST

Senator **BINGAMAN**. OFPP is now preparing guidance to regulate consultants' conflicts of interests, and detailed regulations will be drafted by DOD, NASA, and GSA. What are the major considerations that should be brought to bear in producing workable rules?

Mr. **VANDER SCHAAF**. The major consideration is to develop rules that will ensure that consultants will not benefit either directly or indirectly in the advice that they are providing to the Government. To preclude this benefit, consultants should be required to provide a registration that lists past and current consulting services. This registration should identify the type of services performed, when they were performed, and for whom the services were performed. The contracting officer should be required to check the registration and provide a documented declaration that no contractor conflict of interest or the appearance of conflict of interest exists. Should conflicts of interest later become evident, suspension and debarment should be considered and criminal or civil penalties should be imposed.

CONSULTING SERVICES PROBLEMS

Senator **BINGAMAN**. In your testimony you noted that there are still significant problems in terms of consulting services used by contractors. Is this an accounting problem or are there problems in terms of misuse of consulting services by contractors? Please describe some examples of these problems.

Mr. **VANDER SCHAAF**. There are accounting problems and there are also problems associated with the possible misuse of consulting services by contractors/witness operation "Ill Wind."

The primary source of my information regarding consultant service problems is a Defense Contract Audit Agency (DCAA) report on a Special Audit Task Force on Contractors Consulting Costs, dated October 24, 1988, and a follow-on audit completed in May 1989. The first audit was performed by DCAA at the direction of Secretary of Defense Frank Carlucci and involved 12 major contractors. The follow-on audit was initiated by DCAA and involved 27 contractors.

The DCAA audit concentrated on the accounting and auditing aspects of consulting costs. According to DCAA investigatory methods were beyond the scope of audit procedures and were not applied in the review. At five locations included in the first audit, DCAA auditors found specific evidence which was indicative of suspected illegal activities and DCAA auditors referred the matters to appropriate DOD criminal investigative agencies.

The following accounting and accounting related problems have been associated with professional and consultant service costs incurred by Government contractors:

Erroneous classification of consultant costs

—Direct cost vs. indirect cost. Costs were charged to overhead (indirect) accounts and allocated to all contractor business which should have been charged direct to commercial contracts.

—Overhead cost vs. independent research and development bid and proposal (IR&D, B&P) costs. Costs were charged to overhead accounts which should have been charged to IR&D B&P costs which were over the cost limitation ceiling. These costs should have been voluntarily deleted from contractor claims.

—Consultant and professional service costs considered questionable under a variety of Federal Acquisition Regulations (FAR) and Cost Accounting Standard (CAS) provisions as follows: a. Fees benefiting only commercial product lines; b. charges expensed rather than capitalized for software modification, installation and implementation. The basic software costs themselves had been capitalized; c. Foreign selling costs incurred at a corporate office allocated to divisions not benefiting from them; and d. Unsupported consultant expenses, travel costs in excess of allowable ceilings and bad debt expenses.

Inadequate support for consultant costs

—Some cases contractor(s) did not produce evidence of services rendered or could produce no written agreements. Other available documentation examined was not adequate. One contractor had submitted a voluntary disclosure to the Inspector General, DOD, alleging that fraud had been present in a variety of professional service and consultant transactions. The DCAA review indicated that the contractor had not identified all transactions which were involved with the improper activity. In this circumstance the DCAA had no assurance that any costs were valid. The DCAA was also unable to identify most directly associated costs attributable to either contractor unclaimed costs or costs DCAA deemed questionable as a result of their audit. The DCAA anticipates significant problems in identifying directly associated costs since nearly all contractors showed great reluctance to provide sufficient information to permit necessary analysis and determination of appropriate cost treatment.

—Lack of centralized contractor control and oversight over the incurrence of professional and consultant services costs. Most transactions reviewed were only supported by sketchy or nonexistent documentation and were subject to little demonstrated internal control. The disciplines necessary to preclude and discourage questionable expenditures were in most cases non-existent.

—Reluctance expressed by many contractors to acknowledge a routine audit right to review available documentation supporting claimed professional and consultant service costs indicated to the DCAA a need for clarification of the Government's minimum requirements for accepting these costs. Most deficiencies observed by DCAA can be corrected by strengthening and revising FAR 31.205–33 cost principles. The revisions are currently in process.

—*Need to remind contractors of the requirements of FR 31.201-6, "Accounting for Unallowable Costs"* and the need for DCAA to obtain sufficient access to assure those requirements are reflected in contractor claims.

Internal control weaknesses

The DCAA found examples of weaknesses in every significant area of internal control. Weaknesses observed are summarized below. Indicated parenthetically are the number of companies of the 12 examined where DCAA found each problem at one audit site or more. Corrective actions are being pursued by on site DCAA auditors through their contracting officers:

a. Determination of need, selection of source, determination of fee, monitoring of service, all performed by a single individual or organization. (10);

b. Absence of a written contract. (7);

c. Description of services to be performed inadequate to (i) ascertain appropriate accounting treatment, (ii) monitor performance, (iii) determine allowability, or (iv) identify whether the fee is a retainer or for services. (12);

d. Absence of documentation demonstrating that service was unavailable in-house or that such availability was considered. (8);

e. Absence of evidence of competition in selection of firm. (7);

f. Absence of evidence that fees were reasonable in view of services procured. (7);

g. Lack of an adequate accounting review to ascertain accuracy of accounting classification. (10);

h. Failure to adhere to existing company policies and procedures. (11); and

i. Failure of internal audit to examine operation of internal controls in the area. (8).

DUPLICATIVE OVERSIGHT

Mr. BINGAMAN. I was pleased to note in your testimony that the Department has made some progress since we heard from you in September in addressing the program of duplicative oversight. It appears, however, that most of the Department's actions consist of ad hoc policy memos rather than permanent regulatory guidance. What steps need to be taken to ensure continuing progress in this area?

Mr. VANDER SCHAAF. As I indicated in my opening statement, the Department is going to have to monitor oversight activities on a continuing basis to avoid duplication. One of the primary vehicles the Department will use in carrying out this monitoring activity is the designation of the Deputy Assistant Secretary of Defense (Procurement) as a focal point for resolving acquisition and contractor complaints of oversight duplication. This focal point was established as suggested in the fiscal year 1989 Defense Authorization Act. The focal point will enable the Department to pin point areas where the policy guidance requires further refinement or is not being followed. Eventually, the Department will have to incorporate all of these policy memorandums into directives or regulations. Policy memorandums are a quick way to begin addressing and correcting the problem of oversight duplication but permanent regulations should have been issued.

SOURCE SELECTION PROCESS

Senator BINGAMAN. Regulatory guidance is now being developed to implement last year's legislation governing disclosure of information in the source selection process. Much of the discussion to date has focused on remedies and penalties in the event of improper disclosure and the need for uniform guidance. A fundamental issue, however, is what types of information should be exempt from disclosure. In terms of enhancing the acquisition process, should we have more or less disclosure of information? What specific types of information should be withheld?

Mr. VANDER SCHAAF. In terms of enhancing the acquisition process, and avoiding recurrences of more "Ill Winds", I would lean toward more disclosure of information. The more information that is disclosed the greater the likelihood of obtaining full and open competition. Obviously, the Government must withhold individual contractors' cost and pricing data and certain proprietary designs, drawings, and manufacturing processes, where applicable.

In my view, information dealing with the performance requirements, technical specifications, designs and drawings, delivery requirements, equipment and material to be furnished by the Government, and any limitations on price or funding as well as how the Government will evaluate or "score" the offerors' proposal should be fully and "equally" disclosed.

COMMERCIAL PRODUCTS/COMMERCIAL-STYLE ACQUISITION PRACTICES

Senator BINGAMAN. Has the Department made full use of existing law to maximize the opportunities to rely on commercial products and commercial-style acquisition practices? Is this an area that requires legislative changes, regulatory changes, management attention—or a combination of the three? What specific aspects of this issue should be given priority attention?

Mr. VANDER SCHAAF. The Department has not made maximum use of commercial products and commercial style acquisition practices based on the findings of a 1986 Defense Science Board report and the findings of the Packard Commission. Both of these reports concluded that substantial cost savings associated with major weapons systems were possible through increased purchasing of items already developed. My opinion is that the area probably requires more management attention as well as a more detailed assessment of what is realistically achievable. The Office of the Inspector General plans to perform a comprehensive audit of the subject area to determine the adequacy of current policies, procedures, and DOD's performance in utilizing commercial products. This audit is in our fiscal year 1990 work plan.

QUESTIONS SUBMITTED BY SENATOR MALCOLM WALLOP

DOD SIMPLIFICATION AND STREAMLINING REPORT

Senator WALLOP. In the DOD Simplification and Streamlining Report of December 1988, we were given several proposals for amending the law to further simplify acquisition procedures. One of the DOD proposals involves an amendment to the Competition in Contracting Act allowing a contracting officer to award a contract without discussions on a basis other than price alone. Such a proposal might result in more realistic initial offers under a contract solicitation. It could also open the door to arbitrary award decisions to favored contractors. Is this a proposal worth considering? Are there ways to explore the benefits of this proposal while preserving the rights of all offers during a solicitation process?

Mr. MATH. We are not aware of any studies or proposed methodology to identify and test the advantages and disadvantages of allowing an award in a competitive negotiation to be made without discussion. In the absence of existing studies we are not sure that there would be any significant advantages to the proposal. The possible advantages that have been suggested, however, are reduced acquisition time, greater flexibility for contracting officers, and reduced opportunities for leaks of procurement-sensitive information.

While each of these is a worthwhile objective, we think that substantial progress can be made in each of these areas within the framework of existing law.

The principal disadvantage of allowing awards without discussions is that frequently it is only after discussions have been conducted that the contracting officer is in the best position to know that the technical superiority of a particular proposal is worth paying a higher price. Further, by forgoing discussions, an opportunity for obtaining the best deal for the government is lost.

DIFFICULTIES IN IMPLEMENTING REORGANIZATION

Senator **Wallop**. On page 9 of your statement you discuss difficulties with the implementation of the Packard Commission recommendations regarding streamlining the acquisition management organization. Could you give us more detailed insight into the way each of the services carried out the reorganization? Have some been more successful than others in flowing decision-making authority down to the program managers? In the course of our oversight of the Packard Commission recommendations, what directions should we be prodding DOD and the Services to take?

Mr. **Math**. We have completed a report indicating that the Air Force and Navy had not designated a single office or other entity to conduct acquisition functions. Rather, the Service Acquisition Executive function is assigned to different Assistant Secretaries in the Air Force and to the Under Secretary and two Assistant Secretaries in the Navy.

At the request of Senator Roth, we are currently evaluating DOD's progress in streamlining the acquisition organization structure throughout DOD. Our concerns about the decision-making chain at field activities parallel those recently reported by the Institute for Defense Analysis. The Institute's report noted that the Navy and Air Force implemented the Packard Commission recommendations by assigning the Program Executive Officer (PEO) responsibilities to pre-existing officials such as systems and product division commanders. While these officials can now communicate directly with the Service Acquisition Executive, their authority and control over acquisition matters remains essentially unchanged. The Army, on the other hand, created new positions for its PEOs and placed them and their program managers outside the traditional chain of command. However, the Army allowed the traditional chain to retain control over the PEO and program manager's resources.

The Institute's report concludes that the pre-existing chain of command in all three services is still responsible for controlling program resources, assigning staffs, and interpreting instructions, directives, and regulations. Thus, PEOs and program managers see little change in the decision-making process.

We have recently completed field work on Senator Roth's request and are now analyzing the collected data. Although it appears that actions taken by the services have not fully met the intent of the Commission's recommendations, we believe it would be premature to comment on which service has been the most successful in decentralizing decision-making authority. In addition, as we have not completed our analysis, it would be difficult to state what direction the Committee should suggest DOD and the services take to fully implement the Commission's recommendations. Our study should be completed in the September/October 1989 timeframe.

COMPETITION IN CONTRACTING ACT

Senator **Wallop**. Another DOD proposal to change the Competition in Contracting Act involves allowing the Department of Defense to negotiate master agreements with the providers of contract advisory and assistance services. DOD has argued that such master agreements would permit more rapid award of contracts to qualified bidders while preserving effective competition. What are your views on this proposal? Is there a way that such a proposal could be developed to meet the full and open competition standard of the Competition in Contracting Act?

Mr. **Math**. Without the specific wording of DOD's proposal, we cannot comment on whether negotiated master agreements for advisory and assistance services will meet the full and open competition standard. In September 1987, DOD proposed legislation to accomplish this objective, but the Office of Management and Budget neither approved nor disapproved the proposal. The specific wording of that proposal raised several questions such as:

—Would solicitations tend to consolidate requirements to the extent that they unduly favor general or versatile suppliers at the expense of specialized suppliers, including small businesses?

—Would vague or general solicitations (in relation to the orders to be issued) unnecessarily restrict competition?

DOD's 1987 proposal provided a clear example of the difficulty in developing a proposal which maintains full and open competition. Over the years, we have reported that consolidated procurements potentially limited awards to small business firms and sometimes resulted in increased costs. The specific wording of DOD's proposal should be carefully evaluated to ensure that these potential problems are adequately addressed.

PROGRAM EXECUTIVE OFFICERS (PEOS)

Senator **WALLOP**. The Navy chose to conform their implementation of the Packard Commission recommendations on organization to the structure existing at the time. Thus, the systems commanders (NAVAIR, NAVSEA, etc.) became Program Executive Officers (PEOs) over the program managers in their commands. In NAVAIR, this puts over 20 programs under one PEO. In your view, does this create a serious scope of command problem? Are there alternatives that should be considered short of creating another management layer?

Mr. **MATH**. In conducting our work for Senator Roth, Navy officials informed us that some PEOs experienced an administrative burden because of their large "span of control". However, the Navy has taken steps to resolve this matter.

As you have stated, the NAVAIR PEO was responsible for over 20 programs. Specifically, at the time of our field work the NAVSEA PEO was responsible for 64 program managers who controlled 263 programs. The NAVAIR PEO had oversight for 27 program managers who were responsible for 37 major programs, and 16 other program managers who handled 82 lesser programs.

Corrective action initiated by the Navy involved the creation of a "fourth management layer" called program directors in three Navy commands. Thus, the program managers in each of the three commands report to a specific program director, and the program directors reports to the PEO. Although program directors are not authorized to make milestone decisions, they (a) advise program managers, may review their reports and requests before submission to the PEO, and brief the PEO; (b) allocate personnel and equipment to the program managers; and, (c) draft program managers' performance ratings for the PEO's review and signature.

Although program directors appear as a "fourth tier" in the acquisition chain, Packard Commission members told us they did not view these officials as an additional review layer. In arriving at this conclusion, one member stated that one must consider the large number of programs managers and programs and the PEOs' large span of control in various Navy commands. As long as the program director aids in streamlining the acquisition process, he had no problem with their existence.

CONTRACTOR RISK ASSESSMENT GUIDE (CRAG)

Senator **WALLOP**. On page 6 of your statement you provide an assessment of the Contractor Risk Assessment Guide (CRAG) program to encourage contractors to improve internal control systems and to allow more efficient use of DOD oversight resources. After noting that voluntary industry participation has been somewhat disappointing, you suggest that DOD may have to make the program mandatory. Wouldn't we lose a great deal by taking such a step? Should we not rather look to ways of effectively monitoring the success of the program and modify it if necessary to strengthen incentives for voluntary industry participation?

Mr. **MATH**. DOD cannot afford to audit each and every contractor transaction. The first line of defense in controlling fraud, waste and abuse is an adequate control system supported at the highest level in the company. The central concept of CRAG is a verified system of internal controls that would allow DOD to use its oversight resources more efficiently and allow industry to institute preventative steps as opposed to reacting after the fact.

While we strongly support the establishment of sound internal controls, we are concerned that voluntary participation by industry has, to date, been minimal. Additional time or encouragement through strengthened incentives may result in additional industry participation. However, if contractors continue to choose not to participate in CRAG or otherwise demonstrate that they have adequate, verified internal control systems, we would support a mandatory program. As discussed in our testimony, a mandatory program could provide for an independent public accountant's opinion on management's representation of the adequacy of their internal controls.

PROFIT REPORTING SYSTEM

Senator WALLOP. You note in your testimony your view that a profit reporting system is essential in order to meet the objectives of the statutory requirement for an integrated finance plan. Could you provide a more detailed explanation of why you think such a system is necessary to comply with this requirement? How would you answer the concern that such a system might be unduly burdensome?

Mr. MATH. The requirement for DOD to develop and keep current an integrated financing plan was a major step forward in meeting DOD's long term need for industrial resources and technological innovation. This plan would integrate DOD's financing, return on investment, and contract risk policies and measure their effect on overall defense industry profits. However, DOD does not have access to accounting and financial data needed to determine the level of current profits or to measure how profits would be affected by future policy changes. Without this data, we believe that it would be difficult to make a reasoned judgment on the appropriateness of proposed policy changes.

Industry itself has recognized the potential danger of the cumulative impact of policy changes and commissioned a study to quantify that impact. Because of the lack of data, the industry group was required to make their analyses and conclusions based on the volunteered data from only nine companies, who requested not to be identified. We agree that analyses such as this should be made, however, we believe that regularly submitted data from a wide spectrum of defense contractors is required if the analyses are to be meaningful.

The system we contemplate would not be unduly burdensome. The necessary financial data is essentially the same data that each segment, or division, of a company submits to its home office for inclusion in the company's financial report to the Securities and Exchange Commission. We do not believe that the submission of this segment data to a central source would be burdensome. The submission, aggregation (to protect the confidentiality of the data), and the analysis (by a non-government agency), could be done at a minimal expense.

10 U.S.C. 2325

Senator WALLOP. On page 9 of you statement you indicate that the Department of Defense has not taken full advantage of existing laws and regulations to procure commercially available items. In 1986 Congress enacted 10 U.S.C. 2325, which expresses a policy of clear preference for non-development items including commercial products. Does this provision need to be amended? In exercising our oversight responsibilities on the implementation of this provision, how can we measure progress without unduly tying up the system with new requirements?

Mr. MATH. We believe changes to 10 U.S.C. 2325 are not needed at this time. During the question and answer session, we suggested that an annual reporting requirement, similar to the one-time report required by the 1989 Defense Authorization Act, may be needed to assure continued management emphasis on procurement reform, including the use of commercial products when appropriate. This may be an appropriate method of exercising the committee's oversight responsibilities in this area.

My statement referred to our recent review which found that DOD lacked management emphasis on using commercial products. For example, DOD had created a position of "assistant for commercial acquisition" to promote and encourage the procurement of commercial products. However, the individual spends only about 25 percent of his time promoting and encouraging the procurement of commercial products. We also found DOD was reviewing and revising a DOD directive, manual, and pamphlet but their issuance has been delayed for several months. These documents would provide contracting personnel with detailed guidance on what constitutes commercial items, the methods of using commercial products within the systems acquisition process, and the facts to consider when developing commercial acquisition strategies. We also found that acquisition personnel needed more training on commercial products.

A second problem identified in our review is the absence of data to identify either the type of product that DOD could buy commercially or the potential value of these procurements. Without identifying the extent of the problem, it is difficult to identify what needs to be done or to measure progress.

A separate but related effort involves DOD's and the Office of Federal Procurement Policy's efforts to develop commercial style procedures. Government procurement procedures differ substantially from those employed in the private sector. These differences result from several principles associated with government procurement which are not found in the commercial world. For example: All potential offerors must be given an equal opportunity to compete; procurement decisions must be objectively justifiable to the public and to others outside of DOD; unsuccessful competitors must be given the opportunity to protest; and Government procurement is used to support certain social goals.

These principles deserve serious consideration as part of DOD's and the Office of Federal Procurement Policy's efforts to develop streamlined, commercial style procurement procedures.

ILL WIND SCANDAL

Senator **Wallop**. In the wake of both the Packard Commission report and the reporting on "Ill Wind" investigations, corporate self-governance has been a highly-visible issue. On pages 3-5 of your statement you mention some recent initiatives on this front. With respect to the new voluntary disclosure agreement, could you give me the status of the new agreement format? How does it differ from the old one?

Mr. **Vander Schaaf**. The standard voluntary disclosure agreement was revised by the Office of the Inspector General, Department of Defense, and the Department of Justice. The date of the revised agreement is May 5, 1989. The purpose of the revision is to clarify the program's requirements and procedures.

The significant clarifications contained in the revised agreement are as follows:

a. Cost impact information.—There is now a requirement that a good faith statement of cost impact along with supporting documentation be provided if a contractor has conducted an investigation.

b. Detailed statement of facts.—The agreement recommends that a contractor's voluntary disclosure report include a detailed statement of facts which should contain the identity and role of employees involved in the matter disclosed. The Government may request supplemental information, including information provided by an individual interviewed by the company. The contractor may, in its discretion, provide the supplemental information. Declination to provide supplemental information may affect the Department of Justice Voluntary Disclosure Guidelines. There is no requirement that privileged memorandum of interview be provided by a contractor to be admitted into the voluntary disclosure program.

c. Recognition of attorney-client and work product privileges.—The Government recognizes the contractor may assert privileges to the extent they may exist.

d. Report will not be used as admission.—The report will not be used as admission against the company in civil or criminal proceedings. The Government, however, may make use of the report for other purposes.

e. Employee's rights.—The agreement clarifies employee's rights with regard to representation during interviews.

CRAG

Senator **Wallop**. What is a reasonable timeframe for us to see how well the program is working?

Mr. **Vander Schaaf**. I believe that by the end of this year we should be able to determine whether a significant number of defense contractors elected to use the CRAG to (i) demonstrate their willingness to help the DOD ensure that DOD oversight is commensurate with the quality of their internal controls; and (ii) demonstrate their commitment to corporate self-governance. We should also be able to see if the DOD achieved significant improvements in making its oversight more efficient and effective, especially in the areas of eliminating duplicative, overlapping, and unnecessary oversight.

MONITORING PROGRESS OF CRAG

Senator **Wallop**. What internal feedback mechanisms have been established in DOD to monitor progress?

Mr. **Vander Schaaf**. The CRAG program is scheduled for periodic evaluation, as part of the Department's review of its management initiatives and programs contained in the DOD Management Improvement Plan (MIP). The Department will review contractor participation and program issues identified by the DOD CRAG Steering Group. The Steering Group will maintain communication with the Council on Defense and Space Industries Association (CODSIA) to receive feedback from industry representatives.

MEASURING EFFECTIVENESS OF CRAG

Senator **Wallop.** By what standards will this subcommittee be able to measure the effectiveness of the CRAG program?

Mr. **Vander Schaaf.** As you know, the CRAG program brought together industry and DOD representatives to identify mutually acceptable internal control objectives in five high-risk areas. I consider this cooperation to be the first CRAG success story. The program is, of course, intended to be used by both the DOD and the defense contractor community at local plant levels to address longstanding issues regarding DOD oversight levels and contractor internal controls.

CRAG program effectiveness depends on two conditions: First, the DOD will have to demonstrate improvements in coordinating its oversight of defense contractors, especially in eliminating duplicative, overlapping, and unnecessary oversight. The CRAG is designed to help administrative contracting officers and oversight personnel, both auditors and program reviewers, to do just that. Second, the defense contractor community will have to demonstrate improvements in the reliability and quality of their internal controls. The CRAG is designed to give contractors an opportunity to evidence the reliability and quality of their internal controls in specific risk areas. At the same time, contractors and DOD representatives can discuss the need for specific oversight levels in those areas. The DOD is committed to ensuring that its oversight is commensurate with the quality and reliability of contractor internal controls. Reductions in oversight levels will be made where it is warranted.

With these conditions in mind, general standards for measuring program effectiveness may include: number of top 100 contractors who are participating in the program; number of participating contractors who are satisfied with the program; and, number of cases of poor contractor internal controls corrected as a result of CRAG evaluation.

It is likely, however, that purely quantitative measures will not suffice to determine how well the CRAG is fulfilling its objectives. The CRAG is intended to improve DOD and industry relations by enhancing communication and cooperation. How much of a contribution the program is making along those lines may be difficult to measure. One indicator will be whether there is interest in expansion of the CRAG itself to cover more aspects of contractor operations.

COMPETITION STATISTICS

Senator **Wallop.** On March 28 your office issued a report claiming that the Defense Department's competition statistics for fiscal years 1986 and 1987 were greatly overstated because of the flaws in the method of reporting "competed procurement dollars." What is the basis of your disagreement with DOD's reporting method for competed procurement dollars? Has there been any resolution? If we accepted the IG's methodology, what differences in the trends from those reported by DOD for competed dollars since 1984 would we have seen? If the Department of Defense had used the IG method for reporting competition levels since 1984, would this have indicated a different set of management actions on the part of DOD during this period?

Mr. **Vander Schaaf.** The basis of our disagreement with DOD's reporting method for competed procurement dollars is that DOD classifies as competed procurement dollars all awards where more than one offeror was solicited, irrespective of the number of offers *received.* We believe that an award should not be considered competed unless offers are actually received from two or more responsible offerors. We think the intent of the Competition in Contracting Act of 1984 (CICA) is very clear on this point. It requires awards with only one responsible offer received to be recorded as "noncompetitive procurements using competitive procedures." DOD does not record this category correctly, and does not report it at all in its annual reports to Congress on competition.

There has not yet been any resolution of this issue.

If you accepted the IG's methodology, we don't know what differences in trends you would have seen since 1984, although the percentages of dollars reported as competed would have been significantly lower. The CICA was not fully implemented until fiscal year 1986, and our audit covered only fiscal years 1986 and 1987.

We do not know what management actions DOD would have pursued since 1984 had they used the IG method for reporting competition levels. We do know that there is demonstrable harm to the Government when an award is categorized as competitive when it actually is not. In such a case, the offeror would be exempted from the requirement to submit certified cost or pricing data, and the Government would be denied the remedy to adjust the contract price under the provisions of Public Law 87-653, Truth in Negotiations Act.

REDUCING DUPLICATIVE OVERSIGHT

Senator **Wallop**. On the subject of reducing duplicative oversight of defense contractors, you indicate the Inspector General's participation on a joint working group for reviewing new areas where duplication may be a problem. What is the joint working group's timeframe for carrying out the review of the new areas? When can we expect to see the results of this effort?

Mr. **Vander Schaaf**. First of all let me clarify that the areas being reviewed are not new areas per se. When the working group was established in July 1987 they identified 18 areas for review to determine what, if any, policy changes were required to prevent duplicative and/or excessive oversight of defense contractors. As they complete the review of each area, they recommend whatever policy changes are required. To date, the group has completed reviewing 13 of the 18 areas selected. Policy changes have been made in six areas, policy changes are in process in two areas, and no changes were required in five areas. The remaining five areas are under review. I hope that the review will be completed and all the required policy changes issued within the next 12 months. However, the overall review is, in accordance with legislative requirements, under the direction of the Office of the Under Secretary of Defense for Acquisition and to my knowledge they have not established any specific timeframes for completing the review.

[Whereupon, at 3:18 p.m., the subcommittee was adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

TUESDAY, MAY 16, 1989

U.S. SENATE,
SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

DEFENSE TECHNOLOGY BASE

The subcommittee met in open session, pursuant to notice, at 9 a.m., in room SD-608, Dirksen Senate Office Building, Senator Jeff Bingaman (chairman of the subcommittee) presiding.

Committee members present: Senators Bingaman, Glenn, Gore, and Lott.

Committee staff member present: Andrew S. Effron, general counsel.

Professional staff members present: Michael J. McCord and William H. Smith.

Minority staff member present: Jonathan L. Etherton, professional staff member.

Staff assistant present: Debra A. Rice.

Committee members' assistants present: Milton D. Beach, assistant to Senator Glenn; Leon S. Fuerth, assistant to Senator Gore; and Charles Pearcy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR JEFF BINGAMAN, CHAIRMAN

Senator **BINGAMAN**. Why don't we go ahead and start. I think there may be other Senators joining us as we go forward, but we scheduled it for 9 a.m. so why not get on with it, since all of you are busy and have other things to do.

The subcommittee meets today to receive testimony on the defense technology base and how it might be made more effective, hearing testimony on bills that we have received over the past 2 years, and hopefully this will reveal some progress that has been made in retaining our position as a technology leader in the world. I am sure there is a great deal that still needs to be done.

Earlier this year the committee received the Department of Defense and Department of Energy critical technologies plan that was requested in last year's authorization bill, and there are copies of that available for anybody who would like it.

We have had a series of comments on it which we may be in a position to make public sometime in the next few weeks. We are going to check with the people who made those comments to see if they have any concerns about that before we do.

Today we anticipate receiving comments and recommendations on how the Departments of Defense, Energy and Commerce should proceed in developing some of these technologies and how next year's critical technologies plan could be improved.

We also received an updated version of that plan that has more detail in it on NATO and Japanese capabilities in some of these areas.

We would also like to focus on the important issue of dual use of civilian and military technology development. You all have read about the recent publicity surrounding the emerging next generation television, the so-called HDTV. The Defense Advance Research Projects Agency, DARPA, has taken a close look at the military implications of HDTV and is planning to provide about $30 million in support over the next 3 years to help pursue this important technology in the United States.

HDTV epitomizes the dual use research and technology quandary that we now face; how to form the right civilian, military and government industry partnerships to ensure that the Nation remains preeminent both militarily and economically as we enter the next century.

Because of the importance of this technology, I have asked the foreign technology monitoring group in DOD, Project Socrates, to do an assessment of the development and the technology worldwide, and that is being prepared and hopefully will be ready to be released in the next week or two.

Over the past several months I have had an opportunity to discuss some of the key issues of maintaining technological superiority with the variety of our national experts, and to review the work of OTA, the CSIS and others who have studied this subject.

In this century, obviously our country has demonstrated its capabilities in science and engineering. Maintaining the lead that we have in some of these areas will require us to change our thinking and approach in some key areas. We cannot legislate this change, but we may have to change legislation in order to have the change occur.

I believe this subcommittee is prepared to consider such changes based on the testimony and the reports and the advice we are about to receive.

Today, we have two panels of witnesses. We have five very distinguished witnesses. The first panel is composed of Dr. Craig Fields, Dr. Alan Shaw, and Dr. Sig Hecker. Let me just briefly describe each of them.

Dr. Craig Fields, who was previously the DARPA Deputy Director for Science Programs, has recently been promoted by Secretary Cheney to be director of that agency. We all congratulate him on that. Dr. Fields is one of the Nation's most knowledgeable persons on the key issues of cooperative defense civilian research and technology development.

Dr. Alan Shaw has managed the program commissioned by this committee to examine the defense technology base management and execution. Dr. Shaw's team has just completed the second part of this study, I'm pleased to report. That study, "Holding the

Edge", is to be released today, and I know that there are copies of that available for anybody who would like a copy.

This is the second [illegible] OTA's assessments on maintaining the defense technology base and looks in greater depth at the issues raised in the earlier report that was issued last year. Of particular interest is the in-depth look at keeping the technology base alive and well in the United States and the exploitation of civilian commercial sector technology for defense needs.

The third member of this first panel is Dr. Sig Hecker, who is the director of Los Alamos National Laboratory. The Department of Energy's National Laboratories represent a scientific and technological resource of our Nation. It may prove to be a key element in solving some of the Nation's technology problems.

We look forward to the testimony of all three of these witnesses. If they would come forward, we will go ahead and get into the testimony, and then I will have some questions after all three have testified.

We have Dr. Fields on my left, Dr. Shaw in the middle, and Dr. Hecker on the right, so why do we not take your testimony in that order. We have a wide range of issues that I think you have been alerted that we wanted to get your views on.

Before I start into questions, I guess I would like you to go through the issues that you think are most important for us to consider.

Let me just emphasize first, and I may again later in the hearing, that we are particularly interested in this hearing and the hearing tomorrow as a way to identify concrete steps that we need to try to take in this year's Defense authorization bill. Obviously we want the long view as well, and we want to know the general direction we are going in, but to the extent that you are aware of legislative changes that are advisable or required in the near future, any information we could get on those would be useful.

Dr. Fields, why not go ahead and give us your thoughts on this whole range of subjects.

STATEMENT OF DR. CRAIG FIELDS, DIRECTOR, DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Dr. Fields. Good morning, Mr. Chairman. I was both pleased and a little amused to receive your letter of invitation because the issues that you raised in that letter for the Department as a whole are about the same list that I am now facing for DARPA. So I have had some time to think about them.

It would actually be better, as I am sure we both appreciate, if the witness this morning were the new DDR&E or the new USDA who could really speak for the technology base and, as you will see, the industrial base for the Department as a whole. I will, however, try to fill in in their absence.

Since I do not want to prejudge the solutions they are going to take to the problems that the Department faces, the way I decided to frame my remarks was in terms of a definition of the challenges they face because that is a necessary first step in meeting them.

In fact, from my point of view there are three challenges that are so significant that they in a sense overwhelm all of the others, and those are what I want to go through. As I go through it, I will intersperse some remarks about what I and DARPA are doing in order to meet these very same challenges.

I want to warn you in advance that virtually nothing I am going to say is new, creative or original. There have been a number of excellent studies on this subject before. You alluded to the OTA earlier. I would mention the 1988 Defense Science Board summary study on the defense industrial and technology base of October 1988; a report called "Technology for National Strategy Report" by the Working Group on Technology submitted to the Commission on Integrated Long-Term Strategy, again in October; and should you take an international perspective, a report from Her Majesty's Stationery Office called "Defense R&D, a National Resource", which is a major British study that was done that includes some very interesting comparative chapters looking at France, Germany and the United States as compared to Great Britain, all addressing the same issues.

Should you be curious, as you should and as you are, about why all of these good ideas have not really happened, let me ask you to just wait until I get to challenge number three, because that, I think, will directly address that issue and that question.

Perhaps the first item and the one that the critical technologies plan as a partial answer to challenge one is to develop a strategic plan for DOD investment in the technology base. From my point of view, we can have a better strategic plan than currently exists. In fact, DARPA is in the middle of such a strategic planning process.

I would like to give you a sense of scale for the enterprise, because that is important. While we have $40 billion in round numbers in our RDT&E request years, in fact about a little less than $1 billion of that is for basic research, a little less than $2.5 billion for exploratory development, and of the SDIO total about $1.7 billion could sensibly be called R&D by my terms and yours as well, for a total of $5 billion.

If you look at the IR&D expenditure, both industry and Defense Department, you have another $6 billion. So we are talking about an investment fund of about $11 billion a year that has to have a strategic plan. That is a major enterprise. That is not a small deal.

Now in formulating such a plan as we are now doing, there are a lot of factors that have to be taken into account, and I think the main value I can add is to list some of these because perhaps not all have been thought about in the past.

One has to be looking forward to what DOD needs are going to be in the future and not what they have been in the past. The fact is that the world in becoming quite unpredictable. There are issues in the Middle East, issues in the Far East, issues of low intensity conflict, counter-terrorism, counter-narcotics, and I can go on and on. There are concerns that have to be added to the concerns that are more traditionally associated, for example, with defense of central Europe. These have different technology needs. That has to be taken into account, since none of the technology we develop is going to be in the field in a year or two. It is going to take a decade or two, so we want to aim for what we will need then, not what we need now or, what is worse, what we needed 10 or 20 years ago.

We have to deal with tradeoffs when we make those assessments, which people do not like to do because it is unpalatable. We have to actually admit that not all issues are equally important. Not all probabilities are the same. Until we are willing to face that and make those assessments and those statements, perhaps only internally, we cannot trade off and really get an investment strategy.

We have to look at technology opportunities. I do not want to be in a position of just throwing money at problems, and for some important problems we just may not have good enough technical ideas. In those cases, a low level of exploratory investment might be sensible, but there is no way to have a large program. That just has to be admitted in a few cases. It is regrettable but true.

We have to look at the future DOD budget climate. I expect it is going to be flat or declining. That says something about the kind of technology we develop.

In DARPA, for example, as you know we have placed a heavy emphasis recently on manufacturing technology for that reason, and we have placed a heavy emphasis on the use of electronics to upgrade field and weapons systems to get improved performance, again because we feared that we would not have the funds to get the platforms that we really wanted and thought that we needed. So that is another issue.

We have to try to balance all investment strategy and couple it with the investment strategy of our allies. We have to do this for cost savings, to achieve some commonality. We have to look at issues of licensing technology, and I think we have to face something which we would just as soon not face, namely that there will be some conflicts of interest between what is right for military security and what is right for commercial security. They are not the same. Different government departments will and should optimize for what they are supposed to do, and we should have a sensible adjudication mechanism when those conflicts arise and not make this a matter of emotions and so on.

This will just happen continuously in the future, and it should happen. There is no reason why it is unusual or should be avoided. It cannot be avoided.

We have to look at U.S. private investments. I do not have the resources to be redundant with the venture capital community and the investment community. That is one of the reasons I work closely with the venture capital community, so that we can sort of balance what we do and what they do.

You have to look at the intellectual property regimes that are in operation in the Department both with regard to foreign investments where we have those joint programs and domestic investments. For example, lately I have seen a trend that I find most disturbing. I used to and still do try to give patented data rights to the contractors in order to motivate them to provide more investment themselves. Otherwise they own nothing.

Lately I find that with some frequency they then take the results and license it to foreign firms. That is not quite the result that I want. So we have to deal with that problem as well. There are techniques we can use to deal with it.

We have to look at the longer range human resource problems. Sometimes those will be in conflict with what would look like the optimal investment strategy at the moment.

In DARPA, for example, we actually explicitly have some programs concerned with nurturing the next generation of scientists and engineers, even though that is not an explicit part of our charter. For example, we run over a dozen private production lines for semiconductors, and we have just started a program of encouraging students to have a little practical experience of 3 to 6 months on those lines so they can learn advanced manufacturing technology in a way they otherwise could not.

We have to look into the use of simulation and modeling technology like the program jointy done between DARPA and the Army to help us decide what we want before we spend to try to get it. Our intuitions are not good enough so that we can guess, when you look at the panoply of weapons systems on the battlefield, complicated situations and so on, whether it is better to have this weapons system or that. We have to do some simulation studies, and we are doing more of that.

We have to try to facilitate transition. As you know, there is no magic solution to that problem. Prototyping addresses the problem. Issues like concurrent engineering where we are doing design work concurrent with manufacturing work, concurrent with looking at the fielding issues can help with that problem. Some automated logistics activities we have been doing in DARPA can help with the problem, but it is a very tough one and one that is increasing.

There is a trend that we all know which I am going to term "globalization of technology," where about the same techniques are available everywhere at about the same time. I do not know how to reverse this trend, but it undermines a lot of our current strategy which says we may not be able to match our military adversaries in quantity, but we will have better quality.

What if we do not have better quality? What if, in fact, the technology base we have and they have is the same? It is a very difficult issue. We can only address it by speeding up that transition from the lab to the fields.

We have to deal with the dual use issues that you raise. We have to deal with issues of consortia, and I can go on and on. These things, to me, are the elements of a comprehensive plan, a plan that includes schedules and milestones and cost profiles, and that is what we need to do and are trying to do in DARPA.

Now that is what I wanted to say about challenge one. I wish that were the bigger challenge. Actually it is much more difficult to deal with challenge number two; namely, we have to plan to maintain an industrial base for the Defense Department. The only way the military services see this tech base is through the industrial base, when they can buy something, where they can get it in quantity, where they can get it maintained, and when they can get it into use.

In fact, we have very serious problems with the industrial base which I consider more difficult to deal with than those problems I mentioned vis-a-vis the technology base.

Those problems are of two sorts. One is an increasing foreign dependency at the level of components, materials, and in some cases subsystems. This is something the Defense Science Board addressed in 1987 regarding semiconductors, but it increasingly applies to computers, to advance materials, manufacturing tools and so on.

The second issue is a sort of increasing flow of firms exiting from the defense business. This is at the systems level. So let me talk a little bit about both of those.

First with regard to increasing foreign dependency, there are really two aspects of that problem. One is dependency to build military systems. Do we really want to depend on foreign firms or U.S.-located foreign-owned firms for the critical components and technology to build our weapons systems. That is an open question and a policy question.

The second one is a little larger than that; namely, to what degree do we as a nation want to depend on foreign sources for technology. We do not want to do it for food. We do not want to do it for energy. Those are nationally explicit concerns. Do we want to do it for technology? It is a big issue that has not yet been faced as far as I can tell.

If we do not want to have unlimited dependency, and I am sure we do not, for what industries do we want to control dependency? I have my own rules for doing that in defense. One is industries that are important for the functioning of defense weapons systems; that is, the proper technology in those industries. Second, technology that is changing very rapidly so if you get a year or two behind, you are really in big trouble. Third, technologies that have a lot of leverage on many, many weapons systems because I cannot afford to deal with everything.

When you apply that kind of filter, what do you come out with? Semiconductors, computers, manufacturing tools, advance materials, just the kind of things where we are becoming increasingly dependent. It is quite a serious issue.

One of the things I have had to face in our high definition display investment is a matter of definition but one that is profound. What is a foreign firm? What is foreign dependency? Is it location of the firm, location of the R&D or production, ownership, control, voting stock versus nonvoting stock? There are at least a dozen factors, and no one has a definition today.

The point I am trying to make is that technology is not enough. We have to have an investment in manufacturing capacity to have a sustained industry, and there has to be an investment in marketing and sales to have a sustained industry. There needs to be a fair trade environment for competitive pricing.

In the case of consumer electronics versus military electronics, we have seen a case where the decline of the U.S. consumer electronics industry may be undermining the entire electronics industry because we are losing the economy of scale that goes along with the consumer electronics industry.

Now what this all means is that the problem is not only bigger than DARPA but is bigger than DOD. Unless the State Department, the Commerce Department, the Treasury Department, and the DOD all pull together to effect whatever policy we need to develop, we are not going to be able to solve this problem. This is a much bigger issue than the DOD technology base issue I raised earlier.

Now I want to deal with the second part of the industrial base just briefly; namely, the exit of U.S. firms, weapons systems firms, from the defense sector.

You have heard all of this before, profits, return on investment, auditing, accounting, inspections, contracting delays, regulations, funding instability, reporting requirements, lack of protection for proprietary materials, data and patent right policies, export policies, security and personnel issues.

The reports I mentioned before list issue after issue which are causing firms to exit from this business because it is better to be out of it than to be in it. It is a very serious issue.

I would like to stop at this point and go to challenge three, the last thing I wanted to talk about. You will recall that challenge three was the fundamental reason why all these good ideas have not been taken as far as I can tell. That is the matter of the quality of DOD human resources. There is simply no getting around it. Unless we have very good people in the Defense Department, these good ideas will not be taken. There is no legislation that you can possibly propose and pass that will do anything except solve a bit of the problem. We have to face the fundamental, and to me the fundamental here rests on two issues. One is the revolving door legislation in its variety of forms that the Congress has enacted and is considering enacting; and second, the issues of compensation.

With regard to revolving door legislation, I was pleased to read in the paper this morning about a 60-day moratorium on the new legislation. That is good. It will not bring back my deputy director for manufacturing technology who left on Friday. It will not bring back my director who was concerned with low intensity conflict, counter-terrorism and counter-narcotics who left on Friday. It will not bring back the people who left over the last month. The fact is this is a very serious issue.

It is a serious issue not only because of the nature of the regulations but because of their vagueness. What happens is that companies take the worst possible interpretation of the regulation to protect themselves in deciding on their policies regarding recruitments, so that the intentions of the Congress are amplified by a factor of whatever, 10 perhaps, and the effect is very serious.

Let me deal with the issue of compensation. We all know about the major disparity between the income levels and salary levels for scientists in DOD and what they can get and do get on the outside. In DARPA, for example, a factor of two or three or four difference upon the day of departure is normal. That is not abnormal. I can easily hire mediocre engineers. I can easily hire absolutely excellent people in fields that are not technical, which I do not need, but to have absolutely excellent people in engineering and science is just something that is becoming increasingly difficult.

Now I want to go back to the $11 billion investment fund or in DARPA a bit over $1 billion investment fund and ask you all to think about how you would like that managed. I invest in mutual funds, and maybe some of you do as well, because I do not have time to really pay attention to personal finances.

I really would not invest in a mutual fund that advertised that they limited the salary of their portfolio managers to $75,000 per year. I would not have a lot of confidence in that. In fact, that is what is going on at this moment, and it is a very serious issue.

The fact is I need the best people. I now cannot get the best people to replace those who are leaving to come into the Government. I can privatize. With no legislation I can use private resources in order to provide the quality, but by our best calculations that will raise our management costs by about a factor of four. So privatizing comes with a cost that is significant. I think it is just critical to do something about this as soon as possible.

One area that I wanted to emphasize since I am representing DOD as a whole, and not solely DARPA, is the issue of the DOD labs. There are 68 DOD labs, 33 Army, 20 Navy, 14 Air Force and one other, 50,000 people, $8 billion total, of which 40 percent is spent in house. This is a very major enterprise. The fact is every single report over the last few years that has looked at the DOD labs has recommended major changes in order to improve quality, and that is something that is part of this human resource challenge for the new USDA and the new DDR&E. It would be very worthwhile taking a look as to why these problems exist at the DOD labs and, as far as I am concerned, do not exist at a place like Los Alamos.

Those are the remarks I had this morning. Thank you.

[The prepared statement of Dr. Fields follows:]

STATEMENT BY

DR. CRAIG I. FIELDS

DIRECTOR

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Messrs. Chairman and Members of the Senate Science Technology, and Space Subcommittee, I appreciate the opportunity to appear before you to discuss DARPA's activities related to America's participation in High Definition Television.

The Defense Department has for many years acquired high definition displays for such applications as training simulators, command and control systems, and intelligence workstations. Because of DoD needs for high performance in its displays, until now well beyond commercial or consumer demand, we have had a focused R&D program to develop new technology for displays, display processors, and man-machine interaction. In a nutshell, we have been supporting work in these areas for years, but I thought we were in the computer business, not the high definition television business.

During the last few months I received some exciting unsolicited proposals for displays and related components. The display technology embodied in these proposals could have tremendous significance for Defense. These proposals were based on innovative ideas and designs that could lead to much lower cost displays for Defense, even in the relatively small production volumes that the Military Services need. If the technology were mass produced, propelled by the success of HDTV, considerably greater economies would be realized by Defense. In some cases the proposals also promised greater display performance than now available from any available technology, regardless of cost or country of origin, making plausible Defense applications that have heretofore been just dreams (e.g., very large scale dynamic high resolution map displays). Finally, some of the proposed technology had application far beyond displays (e.g., to high speed digital signal processing).

I decided it would be desirable to make some hard choices, review our priorities, and reorient some of our ongoing work in man-machine interaction to accommodate these exciting new ideas, and in the interest of fairness to issue a competitive Broad Agency Announcement (BAA) to solicit proposals from those organizations that might have excellent technologies and capabilities, but not know of DARPA's interest in this area. More to the point, this is the best way I know to find out what industry can do, what industry wants to do, and what industry wants the Government to do. Incidently, we issued our procurement only after we spent months conferring with US industry to get their views.

When I learned more about the international HDTV situation I came to believe that our program was not just desirable but essential. HDTVs will consume large quantities of semiconductors, as you can see from Attachment 1. The country whose companies supply those semiconductors for HDTV will enjoy a significant economy of scale of production, and will have the massive revenues needed for refining manufacturing and the ever increasing expense of R&D required for developing next generation semiconductor products. In turn, that will give those companies competitive advantage in supplying semiconductors for products other than HDTV (e.g., automobiles and telecommunications, and in fact will give them leverage in gaining market share in those other "down stream" industries.)

I received a very interesting report from the Electronics Industry Association of Japan, a Statement on Semiconductors dated 21 November 1988. On page 3 they say "Japanese investment plans [for DRAM production facilities] in the near future have sharply increased. This does not reflect predatory intent but rather a conviction that demand - especially for memory chips - will grow and stabilize with the introduction of new end use products using much larger quantities of DRAMS (such as ... high definition TV)." This explanation for their investment did not reduce my anxiety.

Further, to the extent that HDTVs evolve to be computers, as digital technology inexorably replaces analog technology, an evolution that is inevitable even if its speed is debated, the companies that produce HDTV will have a competitive edge in capturing market share in the computer industry. Again the issues are economy of scale and refinement in manufacturing, as well as R&D for product improvement. This is illustrated in Attachment 2.

Referring to that same Japanese report, on pages 3 and 22 they list some of the other end use products that share a common technology base with HDTV, namely laser printers, digital copiers, intelligent work stations, laser fax machines and personal computers. HDTV cannot be separated from office equipment and publishing, to name just two examples.

Before getting into larger issues I would like to say a few things about the business practices we are following with our high definition display program:

1. None of the work will be classified, although we expect the results to be used in a number of classified programs in DoD.

2. While the result of our work will be subject to the usual US export control regulations, DARPA will seek no additional controls that might cripple US firms in their efforts to export. In particular, if equivalent technology is readily available from non-US sources, then we

may be working at odds with our own goals of bolstering the competitiveness of US industry if we seek to limit exports. In any case our concerns are not with the export of televisions but with the export of manufacturing technology. I hope we can rely on the good sense and proprietary interests of our companies on that score.

3. In order to keep open the opportunity for large scale production, the fundamental technology developed will not be specialized for unique military needs. This would inevitably significantly drive up costs for the military and everybody else. Thus, the issue here is not a matter of spin-off -- crumbs from the table -- but rather that we are dealing with the same component technology in the military and civilian sectors.

4. We will assign data rights and patent rights to the companies involved whenever possible and protect their intellectual property rights, so as to motivate them to invest private capital following the initial higher risk Government funding.

In following these four guidelines we are doing exactly the same as we have with our fifth generation Strategic Computer program in parallel high performance supercomputers, software, and artificial intelligence; in neural nets and high temperature superconductors; and with SEMATECH, intended to develop world class semiconductor manufacturing technology. With respect to SEMATECH, I was pleased to see the recent report "SEMATECH 1989: PROGRESS AND PROSPECTS" being prepared by the Department of Commerce, which supports that we are following the business practices outlined above.

5. We have invited interested parties from Department of Commerce, which includes NIST, the FCC, NSF, the Department of Treasury (Customs), NASA, and other parts of DoD and the Government to work with us on the selection of proposals and subsequent oversight of the effort. My intention is to form an ad hoc Executive Branch Joint Special Projects Office to address this High Definition Display work.

Incidently, DARPA is not deeply involved in the issue of standards, although we have established ongoing coordination with the FCC so as to synchronize schedules and we have invited them to participate in our proposal selection and subsequent program management as described. We have informally reviewed about a dozen transmission standards that have been proposed, and we are planning to use our unique supercomputer capabilities to support a simulation laboratory for exploring transmission standards. We are currently thinking about ways that those transmission standards can be improved and that the US might get a competitive edge by leveraging off of our technology strengths in areas of image compression algorithms, encryption and software, mostly developed through past Defense investment.

6. What about participation of foreign firms or subsidiaries of foreign firms located in the United States? It may not be possible to have an All-American solution given that certain capabilities like producing certain discrete electronic components may only be available offshore or in US subsidiaries of foreign firms, at least during the near term.

As for foreign subsidiaries of US firms, we will not insist that they be excluded from use of the technology developed by their parent company, although we will discuss the conditions under which that transition will take place.

My job is to work with the bidders, some of which will have foreign connections, to get the best deal I possible can for the US, and that is what I intend to do.

7. Cost sharing by industry is a competitive criterion in our program. This is not a Government bail-out; we are serving an essential catalytic role. DARPA's investment will reduce risk for the bidders, and effectively provide them with some lower cost capital.

8. We have tried to work very closely with industry associations, like the AEA.

9. We have asked the Defense Manufacturing Board, a distinguished panel of industry experts, to form a working group to advise us on our program.

I'll return to a discussion of DARPA's current program shortly, but first what is DARPA's larger role in all of this? First, for thirty years my Agency has invested to assure that the highest performance technology is in the US Defense industrial base, in areas such as high performance computers, software, artificial intelligence, computer communications like the ARPANET, advanced materials, semiconductor design, lasers and so on.

Second and more recently, we are investing in manufacturing technology in areas where Defense is essentially the only customer, but such a small and unpredictable customer that private industry has been reluctant to invest to develop the production technology needed to raise quality and reduce costs. Examples include high performance infrared focal plane arrays needed for many weapons systems applications and millimeter wave and microwave monolithic integrated circuits (MIMIC) required for such applications as high performance radars.

Third and most germane for HDTV, over the last few years the Defense Department, with DARPA as its primary instrument, has taken the position that National security requires an assured domestic supply of the highest performance and highest quality technology in our industrial base. There are several reasons. One is mobilization. Some reasonable wartime scenarios include a period of increasing tension, and during that period we need a surge capability. Stockpiling of high technology items is impractical because of the rapidity of change in high technology and the variety of items required, and it is impossible to assure alternative sources of foreign supply for any but the most common items. A second and more compelling reason is that the Defense industrial base cannot be separate from the much larger volume commercial and consumer industrial base, a point brought home by the 1987 Defense Science Board Report on Semiconductor Dependency. The economics just don't allow DoD to go its own way, and as the civilian industrial base moves off shore the risk for Defense sharply increases. In other words, it's hard to separate national security and economic strength. Third and most troublesome, if our military adversaries turn to the companies in foreign countries for their weapons systems technology, perhaps through theft or surreptitious purchase, and if that technology is more advanced or available earlier than in the US, we will be in serious trouble.

DoD can't afford to assure a domestic supply of all technology, and I generally use three criteria in devising an investment strategy. First, we need to concentrate on technologies of the greatest military importance. Secondly, we need to concentrate on technologies that are rapidly improving, so that we suffer a real disadvantage if we get behind even by a few years. And third we must focus on technologies that have leverage for a wide variety of end use products, so as to get the greatest benefit from our investment. Semiconductors, computers, advanced materials and machine tools are clear examples.

DARPA has concentrated heavily in the area of semiconductors, not only with our investment in SEMATECH but also through a much broader program of semiconductor production technology, such as excimer laser, e-beam and x-ray lithography. We have always had a major investment in computer and software technology, and are the only Government Agency supporting the major consortium in that domain, the Microelectronics and Computer Technology Corporation (MCC). Our investment in advanced materials is smaller, but notable for its concentration on the manufacturing of high temperature superconductors and support for several consortia forming in that area.

Thus, DARPA's investment in high definition displays is a natural outgrowth of past investments and our strategic plan. We have to establish the very best high definition display technology, including manufacturing technology, in the US industrial base. Now I would like to turn to the question of what we will do next.

Where are we and what did US business say they could do, wanted to do, and wanted the Government to do? We have received 82 proposals and 5 white papers. The proposals address not only product technology but manufacturing technology, including special manufacturing equipment, embodied in pilot production lines as well. The proposals address components, like semiconductors and displays, as well as high definition display systems. The components and manufacturing technology are also applicable to intelligent work stations and personal computers, and to an extent other office equipment and publishing equipment. I am struck by three things: 1) The contents of the proposals - product technology and manufacturing technology - is outstanding; 2) US companies, in some cases joined by universities, have formed themselves into strategic teams and formed alliances that did not exist before; and 3) There is tremendous cost sharing by industry. Government funds serve as a catalyst and serve to reduce risk, not to bail out industry.

Many of the companies traditionally do not do business with DoD -- we have tried to mobilize a new talent pool. Where defense companies have proposed to play a role they have offered to make use of technology, like signal processing and image compression, from the current defense industrial base. Many of the companies are the innovative small businesses that are America's strength -- but in this case linked to large companies with the know-how to capitalize on invention. There is a strong representation of companies from the computer industry. Two of the proposals were from the Microelectronics and Computer Technology Corporation, or MCC, one of the Nation's leading consortia.

DoD has issued a press release listing the companies and other organizations involved.

We are now reviewing the proposals and opportunities. We will form these teams into a cohesive program, and that will be done very soon. This is routine business practice for DARPA. For example, in the supercomputer part of our Strategic Computing initiative we arranged for a number of computer companies to cooperate in the use of shared chip making facilities that they could not have afforded on their own; to compete in the areas of computer architecture and pricing; and to cooperate in the area of software so that the Mach operating system, our successor to Unix, is now the common standard for nine different types of supercomputers. In the HDTV area I was pleased to see that AT&T and Zenith had joined forces, and we intend to create more such links. Important value will be added to the enterprise by our integration of the high definition display efforts into the ongoing DARPA technology combine. We will make available to the new contractors the very best VLSI design tools in the world; unique facilities for rapid prototyping of analog and digital, silicon and compound semiconductor circuits; the highest speed supercomputers for simulation and design; the most advanced algorithms and techniques for image compression and signal processing; CAD tools for dealing with the mechanical aspects of systems, and rapid prototyping capabilities for mechanical parts; to the extent software is involved, the Software Engineering Institute will help in seeing that the most advanced techniques are used for implementation; as optoelectronics are employed, the latest components will be available from our current contractor base; the latest microelectronics packaging technology will be available to the new players; computer-based and, in some cases, artificial intelligence tools will be available for the manufacturing pilot lines for such tasks as planning and scheduling, as well as for concurrent engineering; the latest microelectronics fabrication techniques will be available through a close link to SEMATECH; and special circuits and boards for signal processing will be introduced.

Further, we keep in close, if informal, contact with the venture capital community. With the permission of both parties, we will try to make connections between those investment sources and companies that have submitted proposals to DARPA.

Finally, we will identify gaps in our program, and solicit additional proposals to plug those holes.

DARPA is essentially unique in the Federal Government in having a staff of technology managers with the experience and track record in National initiatives to make available new technology products in the US defense industrial base; in forming industrial teams and supporting consortia for DoD; and in supporting a vertical and horizontal defense industrial technology base unmatched by any individual US company. The latter allows us to leverage complementary leading edge technologies ahead of anyone else, gaining precious lead time.

DARPA took a first small step by starting our high definition display initiative; and, industry has responded with the next natural step of planning and forming teams that can respond to our need. If, as we believe, HDTV is the driver of advanced electronic technology, the US can be back in the driver's seat again if we just show some initiative and spunk -- now. Thank you.

Senator BINGAMAN. Thank you very much. I will have some questions after we finish with Dr. Shaw's and Dr. Hecker's testimony.

Dr. Shaw, why not go ahead.

STATEMENT OF DR. ALAN SHAW, PROGRAM MANAGER, OFFICE OF TECHNOLOGY ASSESSMENT

Dr. SHAW. Before I start my statement, let me say that Dr. Fields and I have not coordinated our statements. I do not think we have met before today, but what I am going to say is going to sound very similar to what he just said.

In this statement I would like to summarize briefly some of the major findings of the OTA report, "Holding the Edge", as they pertain to the topics of this hearing as I understand them. As you are quite aware——

Senator BINGAMAN. Let me compliment you on the report. I did have a chance to read it before the hearing, and I think it is very good.

Dr. SHAW. Thank you sir. I appreciate that.

As you certainly know, the report is very far-ranging and covers a number of separate but interrelated topics that you asked us to look into, and rather than spend a long time summarizing the report here I request that the summary be entered into the record in lieu of a prepared statement.

Senator **Bingaman**. We will certainly do that.

[The information referred to follows:]

HOLDING THE EDGE

Maintaining the Defense Technology Base

SUMMARY

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Foreword

Technological superiority has been a cornerstone of United States security and industry since World War II. That cornerstone is not crumbling, but over the past decade it has weathered significantly. Foreign companies have made deep inroads into high-technology markets that had been more or less the exclusive domain of U.S. industry. In addition to causing economic problems, this has fostered dependence on foreign sources for defense equipment at a time when the technology in defense systems comes increasingly from the civilian sector. At the same time, the Department of Defense reports that Soviet defense technology is catching up with ours, and sophisticated Western military equipment is routinely sold to third world nations.

These trends—and others—have prompted the Senate Committee on Armed Services to ask what needs to be done to maintain the base of high technology on which U.S. national security depends. This report, the second of OTA's assessment "Maintaining the Defense Technology Base," looks into that question in some depth. An earlier report, *The Defense Technology Base: Introduction and Overview* (OTA-ISC-374, March 1988), provided a broad view of the defense technology base and the concerns regarding its health.

This report develops some of the ideas introduced in the first report. It examines the management of DoD technology base programs and laboratories. It also analyzes the process through which technology is introduced into defense systems, in order to understand why it takes so long and what might be done to speed the process up. Finally, this report examines the exploitation of civilian commercial sector technology for defense needs. It concentrates on the dual questions of expediting military access to civilian technology and keeping the necessary base of technology alive and well in the United States. Volume 2 of this report contains extensive appendices and will be published in the summer of 1989.

The help and cooperation of the Army, Navy, Air Force, the Office of the Secretary of Defense, the Department of Energy, NASA, and the National Institute of Standards and Technology are gratefully acknowledged.

John H Gibbons

JOHN H. GIBBONS
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NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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Summary

INTRODUCTION

Not long ago, the United States was the undisputed technological leader of the world. U.S. military equipment was meaningfully and undeniably more sophisticated than that of the Soviet Union, and our allies sought American technology for their own defense efforts. American companies developed and sold high-technology products to a world that could not produce them competitively. Defense-related developments led American technology and often "spun-off" into the civilian sector, creating products and whole industries. This reinforced a U.S. defense posture based on using technological superiority to offset whatever advantages the Soviet Union and other potential adversaries might have.

As we approach the 21st century, much has changed. The model of U.S. technology leading the world, with defense technology leading the United States, still retains some validity. But it is a diminishingly accurate image of reality. Soviet defense technology increasingly approaches our own, and sophisticated weapons appear in the hands of third world nations not long after their introduction into Western and Soviet arsenals. At the same time, the U.S. military has been plagued with complex systems that do not work as expected, work only after expensive fixes, or simply do not work. Most are high-priced and take a long time to develop. Increasingly, leading edge technology comes from an internationalized, civilian-oriented economy, which puts a premium on exploiting technology as well as developing it.

As a result, the Nation faces a complex set of interrelated problems that bear on its ability to continue to develop and manufacture in sufficient quantity the technologically advanced materiel on which we base our national security posture. There are specific concerns about: 1) the continued ability of the Department of Defense (DoD) and its contractors to develop the technologies it needs; 2) the ability of DoD and the defense industries to turn these technologies into useful, affordable products in a timely fashion; and 3) the ability of DoD to exploit the technology that is being developed worldwide in the private civil sector.

Concern over the availability of the latest technology for defense applications, and the ability of U.S. industry to engineer and produce equipment based on that technology rapidly and affordably, led the Senate Armed Services Committee to request that OTA undertake an assessment of the defense technology base. This is a summary of the second report of that assessment. The previous report, *The Defense Technology Base: Introduction and Overview*,[1] described what the defense technology base is and presented the major problems facing the Nation. This report looks in depth into some of the issues raised in the previous report. It identifies strengths and weaknesses of the U.S. defense technology base and analyzes options for enhancing the strengths and remedying the weaknesses.

This summary is divided into five sections. The first section is an introduction to the topic. The second section outlines options for Congress. The third addresses the strategic management of DoD technology base programs. It examines the system by which the goals of the technology base programs are identified as well as the methods used to allocate resources in order to reach those goals. The emphasis there is on the role played by the Office of the Secretary of Defense (OSD) in guiding and coordinating the efforts of the Army, Navy, Air Force, and other DoD elements. The third section also addresses the management of the laboratories run by the three Services. The fourth section analyzes delays in getting technology into the field. The final section is concerned with "dual use" technology, i.e., technology used in both the civilian and defense sectors.

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[1] U.S. Congress, Office of Technology Assessment, *The Defense Technology Base: Introduction and Overview—A Special Report*, OTA-ISC-374 (Washington, DC: U.S. Government Printing Office, March 1988).

A large part of the technology that ultimately winds up in weapons and other defense systems is either developed or directly sponsored by DoD. This is particularly true of technology that is altogether new, makes a major difference in the performance of defense equipment, and is of little interest to commercial industry. How DoD runs its technology base programs is therefore of major importance. In recent years DoD has spent roughly $9 billion per year on its technology base programs: research (budget category 6.1), exploratory development (6.2), and advanced technology demonstration (6.3A). Roughly 40 percent of this is spent by the three Service departments (Army, Navy, and Air Force). Another 14 percent is controlled by the Defense Advanced Research Projects Agency (DARPA, formerly ARPA). Another 39 percent finances the Strategic Defense Initiative Organization (SDIO).[2] Although all of SDIO's funds are allocated in the 6.3A budget category, according to SDIO only about 15 to 20 percent is actually spent on technology base activities.

The three Services run their technology base programs and their R&D institutions differently.[3] Some of this is the result of recent planning, while much of it results from organizational "cultures" developed over many years. The Army's effort emphasizes decentralization. The Army runs some relatively small research laboratories which focus on selected topics, while larger research, development, and engineering centers are closely tied to "buying commands."[4] The Navy stresses in-house research and development both in the Naval Research Laboratory, a broad-based corporate lab that serves and underpins the Navy's entire technology effort, and in full-spectrum research and development (R&D) centers that nurture ideas from basic research through preproduction stages. These centers have traditional ties to the equipment needs of various functional parts of the operational Navy, but are not formally tied to specific buying commands. The Air Force, which contracts out more of its R&D effort than either of the other Services, centralizes its efforts within the Air Force Systems Command. Its technology base programs are seen as a link between buying commands (the divisions of Systems Command) and the defense industry. The basic theme is to buy technology and make sure it gets to industry. The Air Force has recently adopted the position that technology base programs should be a "corporate investment" funded at some fixed fraction of the budget. The Air Force puts a greater emphasis on R&D-related career paths than do the other Services.

With such diversity (including that added by DARPA, the other defense agencies and SDIO), if the program is to have overall planning and coordination—and not everyone agrees that it should—leadership almost has to come from the Office of the Secretary of Defense.

Actual R&D is performed primarily by industry, universities, and the laboratories run by the Services.[5] In most cases laboratory is a misnomer, although a convenient shorthand. These latter institutions, as a group, perform technology base work in addition to advanced and even full-scale development. They also provide other functions to DoD. Their efforts are generally divided among performing in-house work, contracting out work (and monitoring contractors' efforts), and providing technical advice to program managers and buying commands (a function often referred to as being "smart buyers"). It is very difficult to describe a typical DoD lab because they differ in size, in the mix of these functions, and in a number of other basic elements. However, what they all have in common is that they are owned and run by the government, staffed by government employees, and subject to a large number of laws and regulations. There has been a continuing and, in recent years, rising concern that they are inefficient, ineffective, self-serving and duplicative of industry work, and increasingly hampered in doing their jobs by the conditions of being part of the government.

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[2] Other defense agencies account for approximately 7 percent of DoD technology base program funding. (See footnote 1, p. 19 of this report.)

[3] All three, however, orient their programs heavily toward current product areas. Nontraditional ideas do not fit well into the system.

[4] A buying command is one of a number of organizations within the Armed Services responsible for developing and buying military equipment and systems.

[5] Work is also done by other government laboratories (e.g., the Department of Energy national labs and NASA labs) and various private profit-making and non-profit organizations.

DoD has some important unique characteristics, but it is not the only large organization that relies heavily on new technology nor the only establishment that runs R&D programs and facilities. Large corporations and the governments of other nations do the same. Their specific goals may not be the same: DoD buys defense equipment to meet a threat, corporations seek to develop and market products in a competitive market, and other nations seek to enhance their economic positions as well as their security. But all share the general goal of marshalling technology assets to achieve some purpose. To some extent, these other entities provide some of the background against which DoD must plan and execute its programs (certainly the evolution of the threat is another). But they also provide potential models of management techniques that might be useful to DoD in solving its management problems.

The technology base programs and laboratories produce technology, but that technology is of no use unless it makes its way into fielded systems that the military can use. There is great concern that it simply takes too long to get new technology into the field. Systems take upwards of 10 years to develop and produce, and when they finally become operational, they often embody technology that is viewed as obsolete, either because better technology exists in the labs or in industry, or because consumers can purchase better technology at their neighborhood stores. In the previous report, OTA found that delays are not a technology base problem: they occur after the technology is developed. However, delays are a major obstacle to keeping our technological lead in fielded equipment.

While a majority of the most visible technology in defense systems comes from DoD and companies that contract with it, a significant part comes from the "nondefense" sector. Mundane technology—like bolts—has often come from industries that sell to both military and civilian customers. And at the subcomponent level, much also comes from the civilian side. Increasingly, these "dual-use industries" are sources of advanced technology, sources from which DoD should be able to draw (and in some cases must draw, because the technology is ahead of what the defense world is building). Increasingly, leading-edge technology is developed in the civilian sector and then finds its way into defense applications. But government rules that make doing business with the government different from selling in the commercial sector create significant barriers to companies moving into government work. Some of these companies are heavily involved in defense work, while others now do little or no business in the defense sector. Moreover, dual-use industries are becoming increasingly internationalized, raising issues of the competitiveness of U.S. firms in the world market and dependence on foreign suppliers in defense procurement.

DoD has become less able to drive the direction of technology. While some areas are pursued primarily for defense applications, others are molded by the consumer market. Large commercial markets generate enormous amounts of capital that fuel research and development. That R&D is primarily directed toward applications and products with large potential commercial payoffs. The relatively small amount of business represented by sales for defense applications is in many cases not significant enough to swing the direction of development. There are still many important areas of development that are primarily, or exclusively, defense-oriented. But the pattern of technology originating in the defense sector and "spinning off" into the commercial sector is being replaced by parallel development and, to use the Japanese term, "spin on" of commercial technology to military applications. Faced with this situation, DoD can buy cutting-edge technology developed in the civilian sector, or it can spend large amounts of money to keep a comparable leading edge resident in-house or with defense contractors.

As a consequence, DoD finds itself (or its contractors) having to buy from companies that do not need its business. Large aerospace companies have to play by DoD's rules: defense is their only business, or at least an overwhelming component of their business. But small, leading-edge technology companies can make much more money in the private sector without the trouble of playing by government rules. They can opt out of doing defense work.

This assessment examines dual-use industries through the mechanism of case studies, concentrating on three industries: advanced composites, fiber optics, and software. These present different perspectives. The advanced composites industry is heavily involved in defense business, but U.S. companies may see their commercial base erode as international competition heats up. Moreover, many of the major companies are international or integrated with foreign firms. U.S. fiber optics producers now sell very little for defense applications. But DoD has important uses for their products. Government buying practices form major barriers to these companies doing business in the defense market, and they are beginning to face stiff competition in the civilian market from foreign competitors. Finally, the software industry is one that straddles both worlds, and moves very rapidly. Software is at the heart of most new defense systems, particularly command, control, communications, and battle management systems.

All of these topics have been the subject of numerous studies, which have produced conflicting conclusions. This report pulls together much of that work, along with original research and analysis. Moreover, while DoD management and industrial/trade issues have been the subject of legislation and proposed legislation, the problems are not yet solved. The next section discusses the major issues before Congress.

OPTIONS FOR CONGRESS

The U.S. defense effort rests on a strong, broad, dynamic base of research and development. Government and private institutions, and civil and military establishments all contribute. But this defense technology base is also characterized by:

- a heavy burden of government rules, regulations, safeguards, and procedures that stifle the ability of DoD to develop and exploit technology;
- the lack of an effective system for high-level planning and coordination; and
- the lack of a clear government policy and coherent strategy for dealing effectively with dynamic trends in the international high-technology economy.

To those who have followed defense industry, technology, and procurement, none of this will come as a surprise. These problems—and more—have been noted and studied for at least three decades. But despite repeated attempts to fix it, the system has remained resistant to major improvements. Indeed, the major problems have continued to worsen, although probably more slowly than if no measures had been taken.

The U.S. is not faced with a defense technology base that is in deep crisis. The Services and other defense activities fund a great diversity of research and development, run a large number of laboratories that do credible—and often outstanding—work, and successfully exploit that technology and technology developed elsewhere. But the process has a number of serious shortcomings that may be amenable to significant improvement. Moreover, important recent trends threaten to intensify these shortcomings and magnify their importance. U.S. leadership in high-technology industries that are vital to defense is eroding in the face of strong international competition. Budget restrictions predicted both by Congress and by the Administration will reduce funding for technology base activities at a time when the costs of research and development are increasing. And DoD's ability to compete successfully for key technical and managerial personnel is declining.

On top of all this, a heavy burden of rules and regulations impedes the development and exploitation of technology and the successful transition of developments into fielded systems. The accumulated actions of past Congresses are a major contributor to the difficulties. Laws passed for a variety of good reasons, taken together, bog the system down. Lack of clear policy on the part of both Congress and the executive branch impedes the solving of important problems.

Virtually all the easy solutions have been tried. It is unlikely that any fruitful but painless approaches remain. Congress and the executive branch will have to face some hard choices. These include altering institutional arrangements that—despite their deficiencies—have become comfortable, and sacrificing existing goals in order to achieve more efficient development and exploitation of technology.

Based on the analysis in this report, OTA has identified seven basic issues that profoundly affect the welfare of the defense technology base. These are not specific action items, but rather broad agenda items that warrant congressional attention. For each of these there are many different choices as to what individual policy directions to take, and within those, a myriad of measures (and choices among measures) for implementation. Implementation is clearly important, for without any sense of how to implement a policy, it remains simply an abstraction. There are options that can be implemented only through legislation, because today the law forbids them or provides no way to make them happen. And there are options that can be implemented without changing the law—through executive action or changes in DoD's internal regulations. Congress can have a hand in effecting these sorts of changes by making its wishes known or by using its considerable powers of persuasion.

ISSUE 1: Reforming the Defense Acquisition System

The defense acquisition system is a major contributor to the long delays in getting new technology into the field and erects formidable barriers to exploiting technology developed in the civilian sector. While Congress did not intend the system to be slow, cumbersome, and inefficient, laws passed to foster goals other than efficient procurement have made it so.

The system has weathered many attempts at reform because its problems are rooted in several basic causes. It is dictated in part by our basic system of government which demands checks and balances on the expenditures of large amounts of public funds, provides for a tug and pull between the interests of the executive branch and those of Congress, and permits both branches to reevaluate programs yearly in light of changing factors and interests. But much of the problem can be traced to laws that Congress has enacted to curb abuses and to foster goals other than efficient procurement of defense equipment. Laws and regulations have been added to ensure:

- civilian control over military procurement,
- Administration control over Service activities,

- congressional control,
- protection of congressional constituent interests,
- environmental protection,
- fairness,
- competition,
- accountability,
- honesty,
- controllable business practices,
- minority interests,
- small business interests,
- protection against conflicts of interest, and
- prevention of large profits at taxpayer expense.

These many ends often conflict with each other and with the objective of quick and efficient procurement, which leads to compromises that can satisfy few, if any, completely. Thus, the consequences of achieving these other objectives have included high costs, long procurement times, inefficient production, and restricted access to technology.

To promote these and other goals, the government has developed business practices and criteria that differ markedly from those of the civilian market. Buyer and seller have an adversary relationship; accountability is stressed over efficiency and price; and the government insists on visibility into how its contractors conduct their business. Government imposes restrictions on profits, trade secrets, and accounting procedures that are at variance with typical commercial practices. This discourages many innovative companies from seeking defense business.

History provides little hope that a few clever, relatively painless moves will be sufficient to make the system significantly more efficient while satisfying other goals. **If Congress is serious about making the system work better, it will have to face some hard choices.** One choice is to give efficient procurement greater emphasis over other goals. This would most likely mean that the system would become less fair, less competitive, less accountable, less responsive to minority and small business interests, etc. Another option would be for Congress to give up some of the power it has over major defense programs, or to curtail sharply some of the many centers of power within the executive branch. This would not necessarily make any particular program run better—two layers of management could be just as ineffective as 20—but it would remove major impediments. Instituting multi-year budgeting, which could also make programs run more quickly and smoothly, would likewise require both Congress and the executive branch to give up some power. Finally, Congress could loosen up the rules under which DoD conducts business, allowing business practices to move closer to those of the private sector. But inherent differences between government and private operations will always remain. For example, the government is accountable for the expenditure of public funds and is very sensitive to allegations of misuse. Where a business would be willing to absorb some pilfering if it were exceeded by the cost of prevention, the government is usually willing to spend whatever is necessary to prevent fraud.

Few such moves would come for free. For example, relaxing accountability rules could make it easier for companies to cheat the government. It may well be that, weighing all these factors together, Congress will decide that the current balance among all these interests is proper, and that inefficient defense procurement is an acceptable cost. While concerns for efficient procurement will push in the direction of loosening up the system, a need to respond to a recent history of procurement scandals, failed programs, and high-cost low-quality equipment will likely push in the opposite direction.

ISSUE 2: Independent Research and Development (IR&D) Recovery

Current law permits companies having contracts with DoD to bill to the government, as a cost of doing business, part of the cost of their internally generated R&D program. Industry generally believes that current rates of recovery are inadequate. Some think recovery rates are too high. DoD cannot seem to present a coherent position. IR&D recovery is not treated in this assessment, but it is very likely to be on the congressional agenda. Interested readers are referred to OTA's previous report *The Defense Technology Base: Introduction and Overview*.[6]

ISSUE 3: Reforming the DoD Laboratory System

As a whole, the DoD laboratory system performs its function of supporting defense procurement. As a group, laboratory managers are capable and experienced and provide much of the corporate memory for technology base activities. But the system is vast, complicated, and uneven in performance. The structure of the system as a whole—the number, types, sizes, orientations, and institutional connections of the labs—may be restricting their utility and effectiveness. Moreover, the management system under which these government owned and operated facilities are run is rendering it increasingly difficult for them to function effectively. A long list of rules impedes their daily operations and makes them increasingly unable to compete for highly qualified scientists and engineers. In general, Congress can choose to:

- reform the system itself,
- order DoD to reform it according to congressional guidelines, or
- leave the job to DoD.

Whatever course Congress chooses, it is unlikely that the correct approach will be either simple or obvious.

There are three basic approaches to reforming lab management. The least disruptive would be to alter, within the current civil service system, the rules under which they operate. This could include:

- extending the principal features of the NOSC/China Lake personnel experiment to other labs,
- permitting the labs expedited procurement procedures for scientific equipment and services, and
- providing multi-year funding.

Alternatively, Congress could decide that R&D is inherently different from other government activities, and that the labs should be allowed to operate differently from the rest of DoD. This might include permitting salaries for scientists and engineers to rise above current civil service ceilings and allowing the labs to build and modernize facilities by going outside the military construction process. The most radical approach would be to convert some or all of these facilities to government-owned, contractor-operated (GOCO) facilities, like the Energy Department National Laboratories. Conversion to GOCO could solve some of these problems, but would be no panacea.

Congress should also seriously consider altering the overall structure of the laboratory system. This could include closing some labs, consolidating others, shifting the internal makeup and missions of some, and creating new ones. Corporate research labs, like the Naval Research Laboratory, might be established for all the Services; or the in-house capabilities of many labs could be greatly improved. In the process, the system should get simpler, not more complicated. Greater integration of DoD labs with other government labs—reform of the overall government lab system—might also be considered. This could include forming research centers to spearhead major thrusts into areas of particular significance for both defense and commercial needs. These would be drastic steps requiring careful, detailed study and assessment of the individual labs before implementation. If done correctly, they could lead to greatly improved benefits from DoD R&D expenditures. If done carelessly, they could be counterproductive. At the heart of the process would be devising a system for evaluating the performance of the laboratories and their component parts. This ought to include the quality of work as well as its relevance to both identified Service needs and potential future advances.

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[6] Released March 1988, report No. OTA-ISC-374. Available from the U.S. Government Printing Office, Washington, DC.

Restructuring the lab system may be a necessary response to budget pressures that reduce funds available to run them. Significant reductions could be accommodated by reducing all efforts proportionately, but this would reduce good work as well as bad. Other approaches are closing the least productive and useful labs or effecting a more extreme restructuring of the entire system to maximize performance and utility at a lower overall level of effort.

ISSUE 4: Reforming Strategic Planning of Research and Development Programs

Unlike many governments and large corporations, the Department of Defense does not have a central headquarters-level system for planning and coordinating its technology base programs. Planning is carried out by the Services, the defense agencies, and SDIO; coordination among similar projects is done at the laboratory level. This lack of central focus is repeated both higher up the chain—at the overall national level—and within the individual Services.[7] This is not necessarily bad. If centralization stifles unplanned innovation and healthy competition, fails to support Service needs, or results in decisionmaking by the uninformed, then it is counterproductive. However, lack of overall planning can lead to wasteful duplication of efforts, lack of critical mass to solve common problems, fractionated efforts, and inattention to areas that are on no component organization's agenda. It also risks failing to identify areas of common or overarching significance. If there is to be strategic planning and central coordination, it will have to be done by the Office of the Secretary of Defense (OSD). Congress should decide whether—as many DoD studies have advocated—OSD ought to be given greater power (or encouraged to exercise the power the law already gives it) to plan, coordinate, and oversee technology base programs; or whether Service dominance should be supported and reinforced. More forcefully, Congress could order OSD to develop a strategic planning process to lead to a coordinated, department-wide technology base investment strategy.

As currently organized, OSD oversees Service technology base programs at one organizational level, DARPA at a second, and SDIO only at the highest level. This inhibits real coordination. Moreover, it leads to the lack of a high-level advocate within OSD exclusively for technology base programs, lowering the status of technology base programs within both DoD and Congress.

Strategic planning and program coordination are different from central management. The former refers to a strategic OSD planning function providing the ability to orchestrate the entire program. OSD could perform this planning role from a broad perspective over all the technology base activities that the individual Services do not have, but it would lack the detailed information and insight into the workings of specific programs necessary to manage them effectively. Planning and coordinating programs and then letting the extensive Service R&D organizations manage them is different from aggregating similar programs and managing them from OSD.

Congress could also define more clearly what its own role is. It seems unlikely that Congress can provide direction to the thousands of individual projects. Congress could actively involve itself in the strategic planning process or confine its activities to demanding that OSD produce and defend a strategic R&D plan.

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[7] The Services seem to exercise more influence over their components than OSD does over the Services.

ISSUE 5: Reforming Government Personnel Practices

Recruiting and retaining qualified scientists and engineers is a major problem for DoD laboratories. In the current sellers' market, government salaries and benefits for technically trained personnel are not generally competitive with either industry or universities. Many DoD labs have given up trying to recruit the best and the brightest. Loosening up the rigid civil service salary structure is a principal component of ideas to reform lab management, and being able to pay competitively—above civil service ceilings—is a major incentive for converting labs to GOCO status. Federal pay raises, if they are enacted and applied in any significant way to scientists and engineers, could substantially help the situation; alternatively, Congress could consider a separate pay scale for scientists and engineers more in line with industry and academia. This may not be a permanent problem, since the market for scientists and engineers tends to be cyclic. But until such time as it turns around, defense technology base efforts are being hurt by a system that cannot adjust to the market. It is also possible that this time the market will not turn around, that the current expansion in high-technology industry—coupled with demographic trends—will keep the supply short for a long time to come. Congress may also want to consider efforts to increase the number of students in technical disciplines. Defense efforts are particularly hard hit by shortages because they mostly require U.S. citizens and can take little advantage of the large number of foreign graduate students in U.S. universities.[8]

Some observers see similar problems in attracting good managers of acquisition and technology base programs. People with the requisite skills and knowledge can command greater salaries in industry, and are reluctant to work for DoD. "Revolving door" rules are also a disincentive to government service. Congress may wish to consider reviewing salary levels. It may also be worthwhile for Congress to gain deeper insights into the inhibitory effects of other employment restrictions and reconsider them in this light.

ISSUE 6: Fostering Greater Coordination Between Defense and Civil Research and Development

National defense benefits from a vibrant civilian technology base. Civilian research provides another large source of technology that finds its way into defense systems, and effective civilian R&D underpins a strong economy that provides greater revenues for defense efforts. The ability of the military to achieve and maintain leading-edge technology will, in many cases, depend on the health of corresponding civilian industries. In a very general sense, economic security is a major component of national security; the ability of the United States to compete economically is intertwined with its ability to compete militarily.

The U.S. defense and civil sectors are not isolated from each other, but they are far from closely coupled. Two relatively separate sectors have evolved—one military and the other commercial. The diffusion of civilian technology into defense systems is hampered, as is the availability for commercial purposes of technology developed in the military sector. Some of this is unavoidable: security often demands that some technology be kept under wraps. But much is the result of government business rules that erect barriers to commercial companies selling to DoD and of a weak, high-level technology policy apparatus.

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[8] The question of potential shortfalls in the future supply of scientists and engineers is addressed in U.S. Congress, Office of Technology Assessment, *Educating Scientists and Engineers: Grade School to Grad School*, OTA-SET-377 (Washington, DC: U.S. Government Printing Office, June 1988); and U.S. Congress, Office of Technology Assessment, *Higher Education for Scientists and Engineers—Background Paper*, OTA-BP-SET-52 (Washington, DC: U.S. Government Printing Office, March 1989).

Other industrialized nations—particularly in Western Europe and Japan—construct their technology efforts with a greater emphasis on economic development over military development than does the United States. They are increasingly demanding that military technology support commercial development whenever possible. In Japan, almost all technology is developed for commercial purposes, and some of it is then exploited for military uses. What is appropriate for these other nations is not necessarily good for the United States, since neither Japan nor any Western European nation aspires to be a superpower. However, these are the nations with which the United States is competing economically. We may be able to benefit from making both military and civilian R&D do double duty.

There are several things Congress could do to foster greater symbiosis of civil and military technology. Steps could be taken to expand the availability for commercial exploitation of the vast amount of R&D done in DoD laboratories and under contract to DoD. Tying the Defense laboratories more closely to those of other agencies—for example by fostering exchanges of personnel or forming major research centers for dual-use technology—could benefit both military and civilian developments. Both the development of technology and its transition into engineering could be helped by movement of technical personnel between government and industry.

The acquisition system could be reformed to make it easier for DoD to do business with innovative companies in the commercial high-technology industries. Government regulations on profits, data rights, and accounting procedures all discourage these companies from seeking defense business.

Congress may find it worthwhile to reconsider current mechanisms for setting technology policies at the highest levels of government. In particular, it may wish to provide for a high-level organization that would oversee and coordinate major government-sponsored R&D programs.

ISSUE 7: Dealing With International Trends in High-Technology Industry

The United States is failing to maintain a competitive commercial base for some technologies that are important for defense procurement. Long standing industrial and trade policies may have to be reformed if the United States is to maintain the industrial capacity necessary to support essential dual-use technologies.

Both Congress and DoD have been concerned about the movement of high-technology industries offshore. This has spawned several responses, including attempts to legislate that DoD buy almost exclusively from domestic suppliers. This approach would probably minimize foreign content in U.S. defense systems, but it attacks the symptom rather than the cause. It would have little effect on the ability of U.S. companies to compete effectively in the international marketplace—a key to having healthy, leading-edge companies here for DoD to buy from.

Having dual-use companies in the United States and available to DoD requires that they be sufficiently competitive on the world market to stay in business. Defense business alone is not usually big enough to keep them afloat. And creating captive companies that exist only on assured DoD business will almost certainly guarantee that technology falls behind the state of the art. Furthermore, cutting ourselves off from foreign technology will mean depriving our defense efforts of important technology that is not available here but possibly is available to the Soviets on the open market.

The United States will have to deal with two fundamental phenomena. First, high technology is a worldwide enterprise. The United States no longer has a monopoly on it. We can change our position relative to the rest of the world, but it is extremely unlikely that we will regain the dominant position the United States once enjoyed. Second, individual companies and entire industries are becoming internationalized. It is becoming increasingly difficult (if not impossible) to define what an American company is. Plants in the United States are owned by foreign nationals or foreign-based corporations. And U.S. companies open plants in other nations. Moreover, international partnerships lead to foreign interests in U.S. ventures and partial U.S. ownership of foreign factories. Protecting U.S. interests and ensuring U.S. sources of supply are therefore not simple matters. This is complicated by the measures that other nations take to protect their companies and their home markets.

The United States has yet to begin to formulate a policy to deal with this situation, both with regard to defense procurement and as it relates to the future of the U.S. economy as a whole. Congress will be faced with decisions on how dependent on foreign sources DoD can be, which high-technology industries must be kept viable in the United States, how to maintain those industries, and how to protect U.S. defense needs as companies become internationalized. Congress will have to formulate policy with regard to foreign ownership of U.S. plants and foreign siting of U.S.-owned facilities—or encourage the Administration to do so.

The solution is almost certain to be found among the choices that lie between the two extremes of buying defense components only from U.S.-based and owned suppliers, and buying solely on the basis of getting the best deal. The former is likely to be incompatible with staying on the leading edge of technology, and the latter may well reduce the U.S. base of technology and manufacturing to a level that is insufficient in time of crisis if not in peacetime. These intermediate choices include buying from:

- U.S.-based foreign-owned companies,
- U.S.-owned companies regardless of location, and
- nearby sources (i.e., Canada or Mexico) regardless of ownership.

In formulating policy, the Nation will have to decide how important foreign ownership is and to what degree domestic siting of development and manufacture is necessary. That policy will have to take into account factors such as: international patterns of trade, manufacturing, and corporate ownership; the costs and opportunities of maintaining domestic capabilities; existing relations with other nations; and the effects of policy choices on foreign relations. It is one thing to be interdependent with an allied nation, and quite another, as the oil shocks of the 1970s demonstrated, to be dependent on just any nation. Every nation ultimately presents a different case, but the spectrum ranges from Canada—which is adjacent, a NATO ally, and defined as part of the North American industrial base—through our European NATO partners, Japan, other European trading partners, and ultimately to nations with which our ties are very uncertain.

The intricacies of formulating policy are illustrated by the problems of trade in defense equipment with our NATO allies. The United States is pursuing multinational cooperation and integration of defense-related development programs through vehicles such as the Nunn Amendment, both for political-military reasons and to promote sales for U.S. defense firms. But these actions will also lead to greater competition from European defense companies in the United States and abroad. Access to European technology will be offset by the diffusion of U.S. technology.

Policy decisions regarding foreign dependence for defense needs fall into the jurisdictions of DoD and the Armed Services Committees. But the broader issue of how the United States should deal with the international economic situation in order to achieve these and other goals will involve a much more diverse cast of players. Congress will have to decide both how it will approach the problem in a manageable way, and what restructuring might be necessary within the executive branch.

MANAGEMENT OF PROGRAMS AND FACILITIES

The system used by the Department of Defense to run its technology base programs is dominated by two major characteristics that are practically unique among large technology-based organizations. First, the system is inherently decentralized, with planning and management dominated by a bottom-up approach. Second, it relies heavily (although not exclusively) on a large, diverse group of government owned and operated laboratories devoted to defense research.

Planning of technology base programs is done primarily by the Army, Navy, Air Force, DARPA and the other defense agencies, and SDIO.[9] The Office of the Secretary of Defense primarily serves as a monitor and data collector, deferring to these component organizations on matters of program direction. OSD collects budget requests and passes them to Congress; after the funding is approved, the component organizations run their own programs. Within OSD there is a hierarchy of oversight that inhibits rational integration of programs: the Services report at one level, DARPA reports one level up, and SDIO reports only to the Secretary of Defense. While not unique in running its programs this way, DoD follows a minority path. Most organizations exert much more top-down coordination and control over planning and management of technology programs.

The labs owned and run by DoD have two general shortcomings. First, most are not strictly laboratories and lack the multidisciplinary pool of talent necessary to be effective in developing a broad range of modern technology. Although they interact, they are generally independent of each other. Developing technology is not the only (or even the primary) mission of most of these labs, but access to that capability underlies the ability to perform other missions. Second, the government-owned, government-operated (GOGO) management arrangement has created many problems that impair the ability of the labs to function effectively. Other organizations structure their lab systems and lab management differently.

Worldwide, there are three major trends in the planning, management, and performance of technology development: top-down planning; centralized management; and collaboration. Moreover, among the governments of other industrialized nations there is a movement away from concentration on defense research and toward emphasizing civilian research that can be exploited for both economic and defense gains, as well as a movement away from government ownership of laboratories.

Department of Defense Technology Base Programs

The Department of Defense does not have a centralized system for strategic planning of technology base programs. It has a federated system in which the central authority—the Office of the Under Secretary of Defense for Acquisition—plays an advisory and coordination role, but either lacks or fails to exercise the power to make major decisions. Those decisions are made by the component organizations—the Services, DARPA, and SDIO. The planning process is both top-down and bottom-up, but it is clearly dominated by the bottom-up approach: most real decisions are made within the component organizations. OSD provides general guidance and reviews Service programs, but does not exercise any strong role in molding them. Attempts by OSD to mold programs (usually to keep to budget ceilings) are often viewed by the Services as uninformed, capricious, and arbitrary. This arrangement generally results in OSD not being able to guide or coordinate the technology base programs. However, OSD has in the past provided leadership for some special cross-Service programs, such as VHSIC, MMIC, SEI, and STARS.[10]

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[9] In fiscal year 1989 the three Services together will spend 40.2% of the technology base funding (6.1 plus 6.2 plus 6.3A). SDIO will spend 39.3%; DARPA will get 13.8%; and the remaining 6.7% will be spent by the other defense agencies—the Defense Nuclear Agency, the Defense Communication Agency, the Defense Mapping Agency, the Defense Intelligence Agency, the Defense Logistics Agency, and the National Security Agency. Among the agencies, DARPA occupies a special place because of its role as a source of R&D to complement Service programs. Efforts of the other agencies tend to be more specialized

This system is not necessarily bad, but it seems to be ineffective in producing a coherent technology base program. Those who believe OSD ought to provide strong leadership find the current system disappointing. To those who believe that OSD ought not to be controlling technology planning, it is the proper approach, even if OSD occasionally weighs in too heavily and disrupts programs. They believe that the users of technology—the Services—ought to plan and control its development, that giving too much power to OSD risks losing Service support for technology base programs, and that the Services are better able than OSD staff to preserve technology base funding.

Central planning and central management are two separate but related issues. Without top-down planning a program lacks, as DoD's currently does, a broad consistency of purpose and coordination to ensure that important areas are not left unaddressed, and that healthy competition among competing developments does not become wasteful duplication. Central management can help ensure that the results of central planning are carried out, but it can also result in control of programs by those least able to understand them.

Organizationally, the problems arise from two sources. First, OSD lacks either the ability or the will to exercise power over the Services. And second, there is no one individual or office that serves as a focal point and coordination center for the technology base programs of all the component organizations. This results in diffusing the power to plan and coordinate, and precludes establishing a high-level advocate for technology base programs who is free of competing interests. The Goldwater-Nichols reorganization changed the players and their titles, but did not correct these basic problems.

Within OSD, all technology base programs *with the exception of SDI* are the responsibility of the Undersecretary of Defense for Acquisition. This is shown schematically in figure 1. But the technology base is only one small part of what he is responsible for—he also oversees the rest of research, development, test, and evaluation (RDT&E) as well as all of procurement. DARPA reports directly to the Director of Defense Research and Engineering (DDR&E) for oversight, but oversight for the Army, Navy, and Air Force programs rests one level farther down the chain with the Deputy DDR&E for Research and Advanced Technology. The DDDR&E(R&AT) is the highest ranking official with responsibility only for technology base programs, but he only has responsibility for less than half the technology base. Thus, the Service programs are coordinated at the DDDR&E(R&AT) level, but they are coordinated with DARPA's program one level higher up the chain, and balanced with SDI only at the highest level. This produces a hierarchy of influence among these component organizations and a mismatch that makes it difficult to balance their demands.[11] Moreover, no one with the power to oversee the entire technology base program can be an

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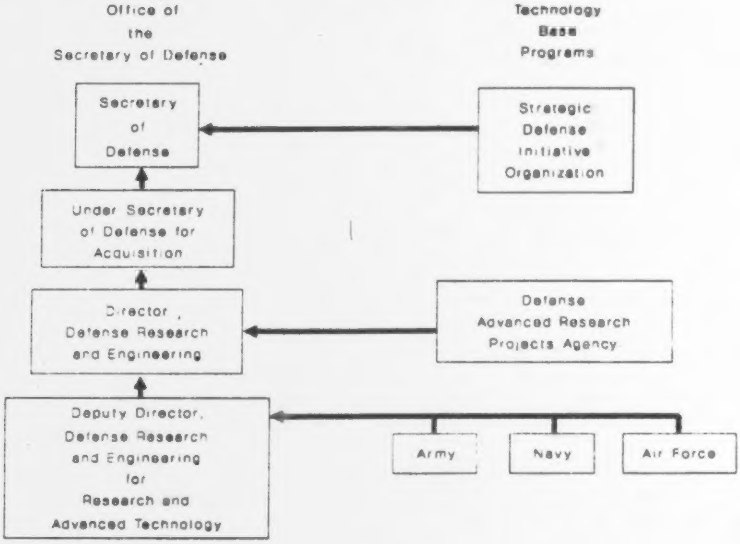
[10] Very High Speed Integrated Circuits; Monolithic Microwave Integrated Circuits; Software Engineering Institute; Software Technology for Adaptable, Reliable Systems.

[11] Manufacturing technology programs, vital to ensuring producibility of items, are accorded a generally lower level of oversight and advocacy than product technology programs.

Figure 1—A Hierarchy of Oversight


Office of the Secretary of Defense
Technology Base Programs
Secretary of Defense
Strategic Defense Initiative Organization
Under Secretary of Defense for Acquisition
Director, Defense Research and Engineering
Defense Advanced Research Projects Agency
Deputy Director, Defense Research and Engineering for Research and Advanced Technology
Army
Navy
Air Force

SOURCE: Office of Technology Assessment, 1989.

advocate for it unencumbered by other, possibly conflicting, responsibilities.

Overall goals for technology base programs are supposed to be specified in the annual Defense Guidance document. But in reality, the Defense Guidance devotes little space to the technology base, providing only very general guidance that can be used to justify just about anything the Services, DARPA, and SDIO want to do. The result is that these component organizations plan more or less independently, based on internally generated criteria, and link their plans to the general language of the Defense Guidance. The OSD review of Service plans is predominantly a data-gathering exercise with little real power exerted from OSD. And real coordination is hampered because DARPA and SDIO programs (which together account for over half of the funding) are considered only at higher levels. Thus the Services and agencies dominate the planning process.[12]

It is not the case that the Services do not talk to each other or to DARPA or SDIO. There is considerable coordination among projects having similar technical foci, but this occurs at the project level and not at the overall program level. There is much technical interchange but little programmatic coordination. OSD could exert strong influence at this level through its technology reviews, but it only conducts a few such reviews each year.

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[12] Top level planning is typically not done within the Services either; ideas come up from lower levels. However, in recent years the Services have been conducting high level studies of their future technology needs: Air Force Forecast II; Navy 21; and Strategic Technology for the Army. The Air Force had been planning some of its technology base program around the results of Forecast II.

Because no single individual or office has responsibility for all technology base activities and only for the technology base, it is difficult to have a strong and consistent advocate for technology base both within the DoD bureaucracy and in relations with Congress and the Office of Management and Budget (OMB). (This problem is mirrored within the Services with similar results.) Nevertheless, OSD personnel spend a large part of their time defending technology base programs or answering congressional mail, leaving little time available to evaluate technology base programs. It is not surprising, therefore, that OSD and the Services do not have a systematic DoD-wide approach to evaluating technology base activities. Evaluating last year's programs is a key to planning next year's. If OSD personnel do not have the time to evaluate last year's programs, they lack a solid basis on which to judge Service plans for next year.

The structure of the bureaucracy is not the only contributor. The relationships among institutions within DoD also play a major role. The Services and DARPA have traditionally had the upper hand with OSD. SDIO was designed to be able to proceed without interference from OSD or the Services. Typically, this sort of "pecking order" will persist in the absence of positive actions to change it.

Personnel is another factor. Although OTA has encountered OSD staff who are competent, dedicated, and overworked, there is a consensus among experts that, like the labs, OSD suffers from restrictions that limit its ability to get and keep the best people. While experts are divided as to how to solve the problem, most agree that paying more and decreasing career restrictions would help. Some believe that the problems would be best solved by vesting power in a professional staff with long tenure, removing it from the hands of political appointees and other "short timers." Others think that only a constant infusion of "new blood" will help: rearranging the system so that very capable managers could take such jobs for a fixed term (e.g., 4 years) and then return to industry.

Department of Defense Laboratories

Reports on the shortcomings of DoD laboratories go back at least 30 years. The mind-numbing array of specific issues that these earlier reports have raised can be captured by two fundamental questions:

- Does the DoD have the type and quality of laboratories it needs?
- Are the management arrangements under which these laboratories are run inhibiting their ability to perform as needed?

Type and Quality of Laboratories

To be precise, DoD has no laboratories. The Army, Navy, and Air Force departments own and operate a large number of research, development, and engineering (RD&E) centers, none of which are laboratories in the pure sense, i.e., institutions solely for conducting research. These centers perform a variety of functions ranging from research through full-scale development to occasional limited-scale manufacture of military equipment items. The mix of activities varies from center to center, with some—such as the Naval Research Laboratory and the Army's Harry Diamond Laboratory—being more heavily oriented toward research than others. As a shorthand, the term "defense laboratories" is used to refer to these government owned and operated RD&E centers.[13]

The structures of the defense laboratories—how big they are, what kind of work they do, etc.—have evolved historically, based in part on the different procurement systems of the three Services and the roles each has seen for its laboratories. These structures are quite different among the labs. However, the management arrangements and modes of operation—which are similar across all of them—are a consequence primarily of law and also of DoD and Service regulations.

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[13] DoD is also supported by contractor owned and operated laboratories such as the John Hopkins University Applied Physics Lab and the MIT Lincoln Lab, and by national laboratories operated by contractors for DOE. For more information on the institutions that support the defense technology base see: *The Defense Technology Base: Introduction and Overview*, OTA-ISC-374 (Washington, DC: U.S. Government Printing Office, March 1988).

Comparing the defense laboratories to other government R&D institutions is difficult because DoD's role as a large purchasing agency makes it almost unique within the government. NASA is perhaps the closest analog because it too purchases products of technology, but it also builds things and conducts research and space exploration. The national laboratories that support the Department of Energy build nuclear weapons and pursue a broad base of research for the furtherance of science. Industry, which also runs laboratories, ultimately builds things.

Comparing DoD labs among themselves is also difficult because no two are really alike. They differ in three distinct dimensions: the subject areas they focus on; the mix among categories of work (6.1, 6.2, etc.); and the weighting of their missions among a number of basic tasks. In addition to conducting research and development, these tasks include:

- buying R&D from contractors and monitoring the contracts;
- advising program offices on responding to proposals from industry to do development and production work (i.e., acting as "smart buyers" of technology);
- providing a base of technical expertise and know-how that can be drawn upon to solve problems as they arise or to follow new areas of technology;
- training young officers in science and engineering;
- solving technology-based problems (or equipment-based problems) encountered by field commands; and
- designing and producing very small numbers of special purpose items needed by field commands.

They also differ in size, source of funding, and the orientations and "cultures" of the organizations they primarily work for.

All of these differences make objective evaluations and comparative ratings of these institutions very difficult to perform. Most evaluations and comparisons appear to be subjective ones, even when performed by highly qualified individuals. For example, Service labs are frequently criticized for not doing top-flight science, especially when compared to national laboratories or major university laboratories; but performing scientific research is not the major mission of these facilities.

Nevertheless, there is a common thread among all the tasks the labs perform: they all require the laboratory to be a center of technical expertise. Most don't *require* the staff to be conducting research and contributing to the advancement of science or technology, but all *benefit* from a staff that has hands-on expertise: a staff member who is contributing to the leading edge is closer to it than one who is simply reading about it, and is more likely to get a seat at the table when the real experts meet.

There are three basic approaches to providing the research core of an R&D facility. The first is to build a large, diverse, multiprogram laboratory with a staff that does research in a broad range of disciplines. The DOE national laboratories fit this description, as do the corporate research centers of several very large corporations such as IBM, AT&T, and General Motors. These labs push forward the frontiers, provide a large pool of talent that can be directed and redirected to solve problems or follow new areas of technology, and provide a base of knowledge from which other labs can draw for more narrow applications. Staffs typically number well over 1,000 and are heavily weighted toward advanced degrees. The Naval Research Lab is the only DoD lab that fits this mold.

A second approach is to build labs with staffs of a few hundred that concentrate their efforts in one or a few areas. Several Army laboratories—Night Vision, Harry Diamond, Electronic Technology & Devices, etc.—are structured this way. These facilities can have programs that are at least as good as those of the multiprogram laboratories in a few selected areas. However, this focus is bought at the cost of loss of breadth and flexibility to respond to a broad range of problems. Moreover, as modern technology becomes more complex, even a single area of concentration can rest on a broad base of underlying disciplines. Size can constrain these laboratories from effectively pursuing their few areas of concentration and from shifting their focus. This problem of lack of critical mass is even more pronounced in the third type, the model followed by most Defense labs: a medium to large RD&E center with small cells of expertise embedded in it. These labs do not have in-house research as a focus, but as a supporting function. Hence the cells of expertise, however skillful and productive, tend to be narrow and thin: in some cases the departure of one or two key individuals could destroy that expertise.

In detail, the Army, Navy, and Air Force run their RD&E centers differently. But in general they all function the same way: technology generated in-house, in other Service labs, externally under contract, and any other place the staff has access to, is assimilated with the aim of transitioning it into the procurement system. The accumulated base of knowledge is used to advise the procurement officers regarding the technical qualities of various proposals to develop and build systems.

The central question is whether this system has been, and is really capable of, delivering the goods. Does the technology transit into and out of RD&E centers, and are the staffs up to the job? This is a very complex question requiring an intensive investigation, but it is absolutely key.

If the answer is "yes," Congress ought to stop worrying about the labs and let them get on with their work. Steps might be taken to make their jobs easier by easing management burdens. However, even if the labs are judged to be doing a good job, budget constraints may make it necessary to consider restructuring.

If the answer is "no," there are a number of steps that might be taken to fix things. These range from taking steps to ease management problems (which will be discussed below) to drastic reorganization of the entire system. Some involve centralizing, consolidating, closing, and moving institutions. **However, such steps have far-reaching consequences and can be nearly irreversible. They ought to be taken only after much deliberation.**

One approach would have each RD&E center include or be closely associated with a large multipurpose laboratory, the small cells of expertise being replaced by a large, diverse pool of technical talent. Clearly, doing so for each RD&E center would be prohibitively expensive.

An alternative approach would be to provide each Service, or DoD as a whole, with a central corporate lab and tie the RD&E centers closely to it. The Naval Research Lab might be a model. Smaller labs of more limited scope are a second choice, but because they are inherently less flexible than multiprogram labs, arrangements would have to be made either to shift their focus or close them down as the areas of technological interest shift. As an alternative to building up the research bases within the Services, greater use might be made of DOE national labs as technology bases for the Services. Consolidating facilities either within each Service or across Service lines under OSD could offset the cost of expanding the underlying labs. But this runs the risk of cutting the links of the RD&E centers to their parent buying commands and further restricting the transition of technology into the procurement system. Unless handled carefully, it could also sever the very important links of the labs to the field commands.

Management Structure of Laboratories

The problems that plague the Services' government-owned, government-operated laboratories (GOGOs) and the causes thereof have been extensively documented. They are inherent in the laws and regulations that govern the operations of these labs. While these laws and regulations have not changed greatly over decades, the trend within the last few years has been for their application to become more onerous, making the government labs less attractive places to work at a time when the market for technical talent has become much more competitive.

The difficulties fall into three related categories: problems in recruitment and retention; difficulties in conducting the day-to-day business transactions necessary to get the work done; and long delays in updating buildings and major equipment. The latter two are problems in their own right as well as contributors to personnel difficulties. Effective management is also impeded by funding that is often unpredictable and fluctuates from year to year.

Even premier laboratories, like the Naval Research Lab, are having difficulty attracting the best and the brightest. Many of the RD&E centers have all but given up trying: they now recruit from a small circle of mostly local schools and hope to "grow" their own in-house expertise. OTA's observations support the points made in earlier studies:

- most of the labs have difficulty hiring and retaining highly qualified personnel;
- the government is at a major disadvantage in competing with industry and academia; and
- the system makes it difficult to reward good performers, penalize the poor performers, or tie salary closely to performance.

The "NOSC/China Lake Experiment," in which the Navy loosened the salary structure for scientists and engineers at the Naval Ocean Systems Center and the Naval Weapons Center at China Lake, helped with recruiting and retention in the entry and midlevels. Similar novel approaches including salary structure and educational opportunities are under consideration by the Services. But since these do not raise the ceiling on salaries; they do little to solve the problem of attracting and retaining key senior people. Losing senior researchers is a double liability: exceptional senior people do exceptional work, and they also attract younger people, many of whom will accept otherwise less attractive work conditions in order to work with someone special.

Interesting work helps to attract and retain people. Good people stay if the work is challenging, if discretionary funding is available to allow them to "follow their noses," and if they have an opportunity to pursue a technical career without being sidetracked into management. But increasingly, technical people in Service labs can only get ahead if they become managers, and in those management jobs they spend an increasing amount of their time in administrative tasks and insulating their bench-level people from bureaucratic "paperwork" imposed from above.

At most DoD labs the Technical Director has little or no control over the most important support elements of his organization—the personnel office, the general counsel, the procurement office, etc., all of which report to parent commands. And construction of new facilities is handled out of military construction (MILCON) accounts for which the labs usually fight a difficult, and often losing, competition with a long list of other claimants. This results in obsolete facilities.

The Defense Science Board has recommended changing the laws and regulations that are causing the problems, loosening up the system to enable the Defense labs to compete more effectively. While this might be helpful, it would require a long list of changes in both legislation and government regulations. This involved agenda could be very difficult to complete. However, a congressional decision to treat the laboratories differently from other government offices might facilitate the changes.

An alternative would be to convert the labs to government-owned, contractor-operated, or even to contractor owned and operated (COCO) facilities. This would seem an easy way out of the morass of government red tape. GOCOs do have greater management flexibility in personnel management, but the evidence for greater flexibility is ambiguous in areas other than personnel. GOCOs can pay higher salaries, can hire and fire more easily, and have much greater flexibility in rewarding good work and shifting personnel. They also display greater flexibility in shifting the focus of their work, and have some advantages—although not so dramatic—over GOGOs in their ability to purchase equipment and facilities.

DOE GOCOs appear to show a greater aggressiveness in seeking out and developing technology. And, at least in the design and manufacture of nuclear weapons, transition of technology into applications is more direct than it typically is in DoD. But this is not necessarily a consequence of their being GOCOs. Size, full-spectrum stance, and research-oriented culture are all contributors. So is the relationship that has evolved between DOE and its labs: the missions of the labs have been construed in a very broad way, facilitating changes in program directions as technology evolves.

While there are some real advantages to converting to contractor operation, there are some important offsetting factors. No government-funded institution can escape oversight merely by converting to contractor operation. Funds derive from congressional appropriations, and Congress holds senior officials of sponsoring agencies accountable for their use. Thus, the tendency is for the government to impose on its contractor laboratories many of the same rules and regulations it lives under. Consequently, with time GOCO labs tend to become more like government-operated laboratories. Government rules under which the sponsoring agencies operate tend to be passed down to the contractors, so the GOCOs are not free of the majority of government impediments. Government policy appears to be that even though government regulations do not apply to GOCOs, GOCO practices ought to be consistent with them. OTA found that the perception of "red tape" and the burden of bureaucratic paperwork reaching down almost to the bench level was no different at GOGOs, GOCOs, and COCOs.

Although there have been many studies of government labs since the 1962 Bell Report, none have questioned its finding that there are "certain functions which should under no circumstances be contracted out. The management and control of the Federal research and development effort must be firmly in the hands of full-time government officials clearly responsible to the President and Congress."[14] There are some functions that are inherently governmental: passing them off to contractors would raise major questions. For example, being a smart buyer and advising a program office on the technical merits of proposals is probably not a responsibility that ought ultimately to be entrusted to a contractor, although today contractors are part of that process.

One advantage of government labs—and a major function—is that they can respond immediately to problems that emerge in the field. Staff can be ordered to stop whatever they are doing and turn their attention to the problem at hand. This would be more difficult for contractors to do, unless the contract had been carefully crafted to allow for the contingency.[15] At several contractor operated facilities OTA was told that response times would have to be measured in months, if not years.

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[14] *Report to the President on Government Contracting for Research and Development*, reprinted in W.R. Nelson (ed.), *The Politics of Science* (New York, NY: Oxford University Press, 1968), p. 200.

While all DoD labs could benefit from fewer restrictions, not all are equal candidates for conversion to GOCO status. Those that conduct in-house R&D would be better candidates than those that function primarily as "smart buyers." Similarly, those that cannot solve their management problems within the government system would be more likely candidates for conversion than those whose managers believe they can.

Other Approaches

After examining a number of approaches used by other organizations to manage technology programs, some basic themes emerge that may be applicable to DoD management of its technology base programs and laboratories. First, in most governments and companies, R&D policy is approved at the upper levels of management and promulgated throughout the organization. Second, centralized control over research projects is the rule. It is supported by frequent reviews and combined with a readiness to cut losses when projects do not pan out and to buy technology outside the organization if that appears to be a more economic approach. Third, both public and private organizations are moving toward collaboration as a means of affording research of the magnitude dictated by modern technology. Finally, on a broader note, the Europeans appear to be moving toward the Japanese point of view that technology efforts ought to be focused on enhancing the economy: a strong high-tech economy will produce both more money available for defense and "spin-on" of technology for defense purposes.

For at least two decades the Europeans have been worried about their economic positions, particularly relative to the United States. But the emergence of Japan and other Asian nations as economic powers has greatly intensified their concerns. This has spurred efforts to integrate the European Community (EC), notably the movement to a "single Europe" in 1992. Moreover, as their fears of economic problems have increased, their anxiety over Soviet military power has receded. Hence the mood is to reduce the drain on the economy of defense oriented R&D, while increasing substantially research oriented toward civilian products. The Europeans are looking for ways to make defense R&D support civil production; defense labs are increasingly viewed as national assets that can be used to help make civilian industries productive. The trend appears to be to do research and exploratory development (the equivalent of 6.1 and 6.2) predominantly in civilian-oriented labs. Only in the advanced development stage would the work take on a more military-oriented cast. The prevailing philosophy appears to be that science and technology policy should be integrated whenever possible with economic and industrial policies. In this regard, the Europeans are moving away from the U.S. model and toward the Japanese model.

It is tempting to take the attitude that if our system has significant shortcomings we ought to adopt someone else's. But this approach is fraught with peril. While there are important lessons to be learned—and these general themes appear to be worth considering—it is not necessarily true that DoD can simply adopt some other system as its own. All organizations are different, and they do not all see themselves as solving the same problems. Management approaches tend to be rooted in corporate "culture" at least as much as they are the result of dispassionate analysis. It is somewhat dangerous to adopt the attitude that what works for some other organization ought to work for DoD. For example, the sheer scope and size of DoD's technology base activities dwarfs nearly every other organization examined, and might even rival the aggregate of them. Furthermore, it is not clear that other organizations are significantly more successful than DoD is in developing and nurturing technology and using it to good effect. The success story everyone immmediately turns to is Japan. But Americans are not, and do not behave like, Japanese. And the Japanese seek to use technology somewhat differently than does DoD.

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[15] For example, level of effort support contracts.

Planning and Priorities

In contrast to DoD, in which a laissez-faire approach and "bottom-up" planning predominates, most Western European governments set national civil and military R&D objectives from the top. Working through central committees or advisory panels, cabinet-level officials set priorities and ensure that the goals are translated into specific programs in either government or private laboratories. The technical experts are usually left free to determine the composition of the specific programs, but they must be able to justify program relevance to higher authorities. In addition, the European Community is exerting an increasing top-down influence on the member nations' research programs. Exploiting allies' work and avoiding duplication of effort is a growing theme. The Japanese approach is perhaps less formal, emphasizing government/industry consensus building and the role of industry, but ultimately major decisions are made by a central body.

Industry generally follows a somewhat similar centralized approach. Major corporations typically have central procedures for establishing business objectives, including identifying the key technologies that are expected to contribute. Once these selections are made, the component companies are free to decide how to pursue them. But corporate oversight typically remains continuous and close.

There has been strong criticism that U.S. defense R&D focuses too much on the near term, both in government and in the private sector. European companies are even more likely than U.S. companies to spend their R&D money for near-term applications. This trend has become more pronounced recently in both Europe and the United States as technology base expenditures have declined as a proportion of defense spending. In contrast, however, budgets for long-term research—particularly civil research—are increasing for many European countries and for the EC. This is tied to a perceived linkage between R&D, economic competitiveness, and prosperity. Governments are seeking to improve their industries' competitive positions by making civil research the driver and blurring the distinction between civil and military R&D. The Europeans' short-term focus and declining funding in defense research appears to be offset by a longer term focus and more generous funding for civil research. In Japan, the government role is greatest in long-term developments for which the risks are high and the payoffs not evident.

Growing fear of Japanese and U.S. industrial competition has fostered European interest in large-scale, centrally directed technological initiatives. These have been largely multinational in nature, such as ESPRIT, EUREKA, RACE, and BRITE,[16] although there have been single nation programs such as the U.K. Alvey program. These are modeled, in part, after a succession of U.S. initiatives—beginning with the Manhattan project—that, while not always successful, propelled technology forward. Large collaborative efforts are also employed by the Japanese, but their efforts tend to have more industry funding and less government money.

A similar approach currently in favor in Europe and to an increasing extent within U.S. industry is to employ special research teams, or "centers of excellence," often in collaboration with universities or potential competitors. These groups concentrate on technologies where a large critical mass of personnel and other resources, or interdisciplinary research, is considered essential. U.S. examples are SEMATECH, the Electric Power Research Institute, Semiconductor Research Cooperative, and the Microelectronics and Computer Technology Corp.

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[16] European Strategic Program for Research in Information Technology (ESPRIT); European Research Coordinating Agency (EUREKA); Research and Development in Advanced Communications for Europe (RACE); Basic Research into Industry Technology for Europe (BRITE).

Management and Control

European governments not only plan their R&D programs centrally, they also manage the execution of those programs centrally. Large companies also tend to keep tight central control. In both cases, the trend is also toward centralized control of laboratories in an attempt to establish the optimum balance between generic research and product-oriented (or mission-oriented) research.

DoD's laboratory system is basically mission-oriented, with most laboratories dedicated to specific warfare specialties. Mission focus provides a closer link between technology and military applications, but it also encourages duplication in facilities, resources, and projects. European labs and programs are increasingly organized along technology, not mission lines. In France, Germany, and the United Kingdom the defense research activites are planned, organized, and managed by central authorities independent of service requirements and development activities. Centrally managed civil research programs are generally oriented around generic technologies. Similarly, EC programs are directed toward enabling technologies, with applications left to industry.

DoD's extensive network of government owned and operated laboratories is unique among Western defense establishments. With the exception of the United Kingdom, European governments own few, if any defense labs, and the British are in the midst of drastically consolidating their laboratory system. However, there are many more European government-owned and government-sponsored laboratories doing civil research.

Industry is generally moving in two directions. Most R&D is being moved out to the component companies. Some corporate research centers are being pruned back or even closed. As money gets tight, it is easy to view corporate research centers as expensive luxuries—"money sinks"—rather than as investments. But at the same time corporations are establishing corporate level centers of excellence in key technologies (or forming collaborative efforts in them). Technology is transferred to the product divisions, at least in part, by assigning personnel from the product divisions to temporary jobs in the central facilities and then moving them back to use and disseminate the technology they studied and helped develop. Industry is also moving in the direction of collaborative research, sharing the escalating costs of modern technology. This research is of necessity technology oriented, not mission oriented.

Collaboration, Coordination, and Technology Transfer

Collaboration in research is now a way of life. High costs and worldwide competitive pressures are forcing governments and industries to pool their resources. Collaborative projects play a central role in Japanese R&D. European governments and industries explored cooperative research in the 1970s and early 1980s, but in the mid 1980s growing concern that they were falling behind the United States and Japan led to a series of serious collaborative measures. Moreover, the European members of NATO, after more than 20 years of ad hoc collaboration on defense and other aerospace projects, are now working on establishing a coherent, systematic program of collaboration. Breaking down the long-standing barriers that have isolated European companies from each other and fragmented markets is an explicit objective of recent high-technology collaborative initiatives. In addition, European companies see that they each have to draw on a broader base of technology than was necessary in the past. Recognition that Germany's strong position in world trade is due, at least in part, to a collegial, collaborative relationship between industry, academia, and government also helped spur interest in collaboration.

U.S. companies are not only engaging in collaborative programs at home, they are also joining with European (and Japanese) companies in various ventures.

Applications: Transitioning Technology From Lab to Products

DoD has been criticized both for leaving technology in the lab too long, resulting in obsolete weapons, and for rushing it prematurely into production—which creates unreliable products. Neither allegation is without foundation. Technology transition is one of the most difficult problems of development. European governments and industries appear to be no better at technology transition than DoD is. Japan appears to have a unique success at transitioning technology rapidly and effectively from the lab into production. The Europeans appear to be studying and beginning to apply the Japanese experience. Teams of researchers, designers, engineers, manufacturing specialists, and even marketers are being brought together early in the life of a product in order to perform in parallel what usually gets done sequentially. The parallel development of process (manufacturing) technology and product technology is considered a particularly important factor.

Examples of the close relationship that is essential between research staff and those who develop specifications exist in all successful companies; but in large and diverse government organizations the liaison and communication that is required may be jeopardized by interdepartmental rivalries and parochialism which only strong management and direction can dispel. In DoD, requirements for new systems are set by the Service buying commands, and development is done by industry. These are obliged by law to stay at arms length; the government labs provide the primary link between them—and the labs are not always successful.

GETTING TECHNOLOGY INTO THE FIELD

Government officials and others have expressed concern and frustration over the age of technology in fielded U.S. systems, particularly those just beginning to roll off assembly lines. Comparisons usually take two forms. First, government and industry researchers have laboratory developments that are clearly superior to what is going into the field. Second, dual-use technology in defense systems often lags significantly behind what is available in the consumer markets, and by the time a system has been in the field for 5 to 10 years it can seem outdated compared to what Ford or Radio Shack is selling.

Technology in production will always lag behind technology in the lab. Taking developments off the bench, engineering them into real systems, and getting those systems into production is a time-consuming process for military and civilian manufacturers, as well as for movie producers, think tanks, book publishers, and many other enterprises. Indeed, very little legislation moves instantaneously from brain storm to law. Major military systems are generally much more complicated than civilian products, and hence the product cycles are much longer.[17] In addition, the process of getting approval to begin a military project is generally considerably longer than the equivalent process in the consumer sector. Furthermore, military systems have long lives, and dealing with frequent updates is a logistical nightmare, so it is not surprising that changes occur much less frequently than the typical yearly changes in consumer products. It appears to make sense to change the current model Toyota because of a relatively small change in engine technology. (Indeed, it helps sales to tell consumers that this year's model is "all new" and "innovative," and technology is often changed just to enhance marketing.) But it makes absolutely no sense to rebuild the entire fleet of tanks every year to take similar changes into account. The problems of maintaining different equipment types in the field mean that decisions to update part of the total inventory, while often made, are not taken lightly. Finally, DoD is not in the business of developing and fielding technology for technology's sake; its job is to get better capabilities into the field in a reasonable time at a reasonable cost. Up to a point, it is not unreasonable to argue that new technology ought to buy its way onto a system.

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[17] In commercial products, complexity is usually the enemy, something to be managed carefully.

Military-specific technology is usually the pacing technology for entire systems, determining the schedule for getting the system into the field and controlling the rate at which the dual-use technologies in the system get fielded. The entire acquisition system is geared to the pace set by these military technologies. It is often the case that after a system design is frozen, the commercial counterparts of technology embedded in it continue to move forward, sometimes dramatically, resulting in several generations of products before the military system is produced. This produces military systems that are not as advanced as some commercial products; but if responding to rapid changes in dual-use technology were to prevent freezing the design of a system long enough to get it into production, none of the technology would ever get produced.

Thus, while it can be misleading to compare fielded military technology to laboratory technology or selected consumer technology, it is important to ask whether new technology can get more quickly and more effectively into the field. (It is also legitimate to ask why the military cannot have the same products—like radios, CRT displays, trucks, and clothing—that consumers can go out and buy.)

The problem of getting new technology into the field is not that the United States is unable to develop new technologies with military relevance. It is rather a problem of the transition of that technology into engineering, the time needed to begin manufacture, and the rate at which new systems are built. It can be improved in three general areas: improving the **insertion** of new technology into acquisition programs (i.e., the transition from technology base to engineering and production); improving the **acquisition** process that engineers and produces systems; and improving the **affordability** of systems so that they can be bought more rapidly.

Technology Insertion

The technology development and system acquisition processes are largely (but certainly not completely) separate. Technology base work takes place in a variety of institutions, including some companies that ultimately build systems. Engineering and production are done in private companies (not always the same ones that did the technology base work) under the supervision of DoD program managers. This causes a major bottleneck at the point at which technology moves from technology base to acquisition. Several mechanisms exist to bridge this gap: general technical interchanges between Service lab people and industry; IR&D and contract research that involve some companies in a development; involvement of lab people with the program offices (part of the "smart buyer role"); and formalized Service transition programs.

Many studies of the transition issue seem to agree that nonsystem-specific prototyping, pursued with 6.3A funds, presents the greatest opportunity to improve technology insertion. It has the potential to solve two problems. By demonstrating feasibility, these advanced technology demonstrations help reduce the high risk carried by some technical developments. And they help correct overoptimism by demonstrating the limitations in the current state of the art. Overoptimism leads to promising too much, which in turn leads to disappointing systems and to lengthy and costly redesign efforts. The new emphasis within DARPA on prototyping is apparently an attempt to ease the transition into system design of technology developed under DARPA programs. DARPA has always been the focus of technology that does not fit neatly into what the Services want to do. However, if the Services do not take DARPA seriously, it is not at all clear that DARPA's prototyping effort will have any use.

Acquisition

In searching for the causes of delays, the acquisition process has been the primary candidate. Even when the system is working smoothly it seems to take a long time to move programs through; but it usually is not working smoothly. And when it bogs down, delays lead to further delays through escalating costs, compensatory stretch outs, and time-consuming attempts to fix any particular program's specific problems. While the consensus is that the system is in trouble, it has weathered study after study without apparent improvement.

Several studies have found that acquisition (advanced development, full-scale development, and production) takes longer than it used to. But the data are not all that clear: there is certainly no obvious trend toward rapidly increasing times. It does take longer in the 1980s than it did in the 1950s or 1960s, but there is not enough data to discern clear trends over the past decade. Studies of fighter aircraft procurement, the most-studied system type, conclude that whatever increases have occurred are in the front-end decision process and in production, not in full-scale engineering development. Data on other systems are less conclusive.

It is generally held that commercial industry completes programs more rapidly than does DoD, but there are significant differences between government and industry that make it possible for industry to avoid many of the basic problems that plague DoD acquisition. These basic problems are "built into the system," they are consequences of the characteristics of U.S. Government. For example, canceling a program that has grown too much in cost or schedule to be profitable is easier than canceling one that, despite schedule slippages and cost overruns, is judged essential for national security.

But enhancing national security is not the Nation's only goal. Goals like fairness, environmental protection, equal opportunity, jobs, and competition all figure into how both Congress and the Administration judge defense procurement programs. DoD itself has goals it must pursue in addition to managing programs efficiently: maintaining the defense industrial base, ensuring that the most efficient producer does not drive the others out of business (contrary to what industry would do), etc. Government is not solely concerned that a program provide the best capability at the lowest cost most quickly. Moreover, the political process in both branches of government—the tug and pull over resources and goals—introduces uncertainty into programs, even when Congress and high-level executive offices do not micromanage programs.

The structure of the DoD acquisition system is much more cumbersome than that of private sector companies. That structure is, in part, determined by government's size and unique role. DoD program managers are accountable to five or six layers of bureaucracy up to the Secretary of Defense. These layers typically have extensive horizontal structure, so the program manager (PM) has to satisfy a large number of people, many of whom have power over his or her program but no responsibility for it. To complicate matters further, the PM reports up one chain for oversight of the program, and up another for the planning, programming, and budgeting system which is responsible for determining the funding for the program. But this involvement of the OSD bureaucracy, as well as that of OMB and Congress, is part of the checks and balances on the expenditures of billions of dollars.

While industry shares many of DoD's problems, it has a very strong incentive to manage successfully: failure could mean bankruptcy. In many instances industry works under a simpler system involving a direct link between the program manager and a high company official having the authority to make decisions, settle disputes, and insulate the PM from external pressures. The PM has responsibility for the program: if it fails it is his fault and his job may be at stake. The DoD PM typically has to obtain several levels of approval for any action; there are many people who, in trying to ensure that the PM does not fail spectacularly, will also prevent him or her from succeeding spectacularly.

Several factors are major contributors to delays in programs: the sequential processes of requirements generation, resource allocation, and system selection; program variability (or instability) caused by many players making changes; bureaucratic paralysis; inappropriate organization for defense procurement; and the quality and incentive structure for procurement personnel. Underlying these are the basic structure of the government, the nature of the bureaucracy, the organization of the DoD procurement system, and the conservative risk-averse nature of government organizations.

Requirements generation and resource allocation involve the Services, OSD, OMB, and ultimately Congress. They are highly political, which often leads to overpromising in order to get program approval. Overpromising leads to cost growth and schedule slippage. But the system makes it easier to readjust the program to these realities rather than to go back and question the requirements that produced them in the first place.

Constant changes in defense acquisition programs are commonplace, leading to cost increases and schedule slippages. Variability results from the requirements process, the risks inherent in new technology, the political/budgetary process, and personnel turnover. While the disruptions caused by these factors can be somewhat controlled, the underlying causes cannot be eliminated.

Baselining—a form of contract between program managers and their Services—was developed to limit changes in programs. But making baselining work requires giving program managers more authority over their programs than they now have. Neither program managers nor Services can control budgets or other changes and conditions imposed by OSD, OMB, and Congress. Moreover, external factors that affect a program—like threat, doctrine, and resources—will cause changes in the program no matter how well it is managed.

However, Congress, OSD, and OMB can decide to limit their direct involvement in a program (or Congress can decide for the others). But, at least in the case of Congress, this would involve giving up power which it jealously guards. Congress has already agreed, in principle, to relax oversight for a few major acquisition programs, which would require reauthorization only at significant milestones rather than annually. As yet, none of these milestone authorizations have been submitted to, or approved by, Congress. Not all members are likely to agree that efficient functioning of defense acquisition programs is more important than other issues they are concerned with, including the (possibly shifting) interests of their constituents. The budget process specified by the 1974 Budget and Impoundment Control Act and Public Law 99-177 (Gramm-Rudman-Hollings) increases Congress' incentives to keep control of as many budget items as possible so that it can engineer the budget levels it agrees to.

Perhaps the most discussed problem is the bureaucratic burden individuals and companies must struggle through in order to do their jobs. A 1977 Defense Science Board (DSB) panel concluded that increases in acquisition times are all bureaucratic: "it does not take any longer to do something, it just takes longer to obtain the necessary approvals and acquire funding . . . ." The program manager's job has become increasingly complicated, accompanied by lengthening time to complete contracting actions and increased regulation, oversight, and auditing of contractors. The overall perception is that of increasing regulatory and bureaucratic burden, but studies have found the picture to be unclear. While some indicators of burden have been clearly increasing, others have remained the same or declined. Moreover, measuring the effects of regulatory and bureaucratic activity is even more difficult than measuring the activity itself. For example, estimates of the added costs due to regulations and bureaucracy range from 5 to 200 percent!

This "red tape" is unambiguously greater in government than it is in private industry. What in industry can be a straightforward, one-step, project initiation process involving the manager and a high corporate officer is in DoD a two-step process involving the PM, a committee within DoD,[18] and Congress. Both the DSB and the Packard Commission recommended bringing the system closer to an industrial model in this regard, and the Goldwater-Nichols Act tried to implement that.

Since the bureaucratic burden arises in part from government attempts to have programs satisfy goals other than getting the job done most efficiently, solutions can be of two types: those that try to streamline the system without changing its mix of goals; and those that seek to change the balance among goals, particularly the balance between having an efficient and successful program and satisfying all the other government goals. One suggested solution is to review all the regulations to determine whether each is still necessary and whether the aggregate could be streamlined somehow, a daunting task in its own right. Another suggestion is to shift the burden of proof from the PM to those who would slow down the project, making the PM innocent until proven guilty. For example, a competition advocate would have to show that the program was insufficiently competitive or that taking measures to enhance competition was important enough under the circumstances to warrant tampering with the program. But some higher authority would have to be responsible for balancing these claims against the interests of the PM who would always be served by ignoring them.

Some DoD programs do better than most: "black" programs (so it is said), and other special high-priority programs. This success is due in part to their high-priority which affords them high-level attention. Clearly, all DoD programs could not be treated that way or the system would overload. These programs also get special exemptions from various regulations. Granting similar exemptions to all programs would nullify the regulations, defeating the purposes for which they exist.

There has been widespread concern about the process that produces PMs and their chief assistants. These people are either military officers or civil servants. In 1986 the average tenure of PMs was about 2 years. This makes it difficult to give them real power over programs that run many times that long, and creates incentives for them to sacrifice long-term performance in order to look good on their watch. The military personnel usually, but not always, rotate rapidly in and out of the jobs in 2 to 3 years. They do not always have prior experience or relevant training. Many of the civil servants do not rotate, and "remain for so long that they resist innovation and change."[19]

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[18] The Defense Acquisition Board, and perhaps others.

Affordability

One of the major contributors to delays in getting new technology into the field is the cost of modern development and procurement programs and the resultant program stretchouts and low buy rates. Almost all important systems cost enough to get close scrutiny by OSD and Congress. The battles are fought each year. The result is often that the funding requested by the program is reduced (in some cases dramatically), which slows the development pace and slips the date at which production is initiated.

Once the program is in production, DoD's tendency is to reduce the funding below what had been projected, in order to keep as many programs alive as possible. This leads to buying fewer of any particular item per year, which has two major consequences. First, obviously the slower the rate at which a system is bought the longer it will take to get the capability into the field. It may not delay Initial Operating Capability, but it will certainly delay the date at which a significant capability is fielded. Second, providing insufficient funds to procure at planned rates raises the unit costs, which further decreases the number that can be bought per year.

DUAL-USE INDUSTRIES

Most of the technology that is engineered into defense systems is still developed in the "defense world" of DoD's laboratories and contractors. This is particularly true of the exotic technologies that are the centerpieces of advanced designs. But increasingly, building those systems depends on developments that take place in the civilian sector, a civilian sector that is driven by the international marketplace. This was dramatically illustrated by events during the first week of November 1988. A company called Avtex, which manufactured rayon fibers for the apparel industry, announced that it was shutting its doors in response to foreign competition in the clothing business. This sent shock-waves through DoD and NASA when it was discovered that Avtex was the only producer of fibers that were critical to the production of missiles and rockets. While other sources could be qualified, and other fibers might be found to substitute for the rayon that Avtex made, that process would take longer than the period of time the available supply of rayon would support production. Negotiations were soon completed to keep Avtex open.

High-technology industries are becoming increasingly internationalized: foreign companies and multinationals are technology drivers. Large international markets generate huge amounts of capital that fuel research and development into new products and underlying technologies. The defense components of these markets are often small, giving DoD little or no leverage over the directions developments will take. DoD has to choose between playing a follower role, or spending large amounts of money to keep a competitive leading edge capability in defense laboratories and industries. But because of the cost of developing modern technology, it seems unlikely that DoD can afford to develop all the technology it needs in parallel with the civilian sector. Dependence on the private sector is not all bad: commercial development of technology is a basic strength of the industrialized, non-communist world. Failure to exploit developments in the civilian sector would be throwing away a major advantage over the Soviets. But relying on the private sector means that defense development and production will depend increasingly on the health of the civilian sector and on the ability of DoD and its contractors to gain access to the products of the civilian sector. Thus DoD faces two challenges: maintaining access to the technology developed in the commercial sector, and coping with the international nature of that sector.

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[19] J. Ronald Fox and James L. Field, *The Defense Management Challenge: Weapons Acquisition* (Boston, MA: Harvard Business School Press, 1988), p. 312.

DoD and Congress face three generic problems. The first is keeping dual-use companies interested in doing defense work. Some are leaving the defense business. Others have technology that DoD could use, but are reluctant to get into the defense business. These attitudes are based primarily on perceptions of the difficulties of doing business with the government, and the problems of doing business in both sectors simultaneously. Second, high-technology industries are moving offshore due to foreign competition. Some have almost vanished, others are on the way. Furthermore, it seems likely that in the future some new technology-based industries will develop in other nations and never take root here. Careful balance will be necessary to nurture U.S. industries while maintaining access to foreign technology. Congress will have to consider U.S. trade and industry policy carefully. Third, entire industries, individual companies, and the many-stepped trails that lead from raw materials to finished components cross many national borders. In many cases, it is nearly impossible to determine what a U.S. company is, while in others it is difficult to separate U.S. companies from their foreign partners. Congress will have to come to grips with the meaning of foreign ownership and foreign siting for the availability of technology, as well as with how dependent the United States can afford to be on foreign sources. These international relationships will complicate attempts to protect U.S. supply sources.

Barriers Between Civilian and Military Industry

Since World War II, the U.S. economy has evolved relatively separate military and commercial sectors. They have different business practices, one dictated by government regulations and procurement practices and the other flowing from the marketplace. In recent years the *international* market has had a considerable effect on shaping the latter.

Government practices have made it increasingly difficult for DoD to obtain state-of-the-art technology in areas where civilian industries are leading, making defense business unattractive to innovative companies and contributing to traditional suppliers leaving the defense business. Many firms that are not heavily involved in defense business are reluctant to deal with the government because they consider it to be a bad customer. Moreover, many do not need DoD's business and can simply opt out. The barriers are not technological, but legal, institutional, and administrative. Some are the direct result of legislation, others flow from DoD regulations, including overly cautious interpretations of laws. Some commercial firms cite excessive regulation, burdensome auditing and reporting requirements, compromise of trade secrets, and loss of data rights. Large defense companies have similar complaints, but have adjusted to working under these conditions. But for smaller companies, getting into the defense business means heavy investment and reorientation of business practices.

A company can organize to do business in either sector, but can rarely do both under one administrative roof. Companies that do business in both sectors typically have separate divisions that are organized differently and almost never share staff, production and research facilities, data, and accounting procedures. These differences are profound. In large aerospace companies the commercial side responds to market conditions, whereas the military side responds to Service programs, government regulations, and the Federal budget. Their planning is "slaved" to the Federal planning and budgeting cycle. Corporate structures and rules tend to mirror those of DoD and tend to pass government encumbrances down to lower level suppliers. Companies doing government contract work have to keep their books in formats that are compatible with government auditing rules and procedures.

Following these and other government rules adds to the costs of doing business, costs that can legitimately be passed on to the government customer. Tighter control of the defense business ultimately translates into higher costs to DoD. The United States is apparently willing to bear this increased cost as the price of other benefits—for example, knowledge that the government is trying to keep the process honest. However, imposing the same rules on dual-use industries has other, farther-reaching effects. It makes them reluctant to do business with DoD and encumbers their products with additional costs that may adversely affect their international competitive positions. When dealing in both sectors, companies can accept either the higher cost of following government business procedures, or the higher costs of maintaining two separate business practices—one for government business and one for other business. With some exceptions, DoD product specifications are also seen as encumbrances; characteristics that are of no value in the commercial marketplace are engineered into the products for sale to DoD.

Government contracts regulate profits, creating a business environment very different from that in which most high-technology companies deal. These companies are used to investing heavily in R&D, recovering their investments through large profits, and then reinvesting in the next generation of product. Moreover, their customers see only the product, whereas DoD insists on knowing how the product was made. Defense contractors get by on small profits, in part because much of their R&D costs are covered either by contract or IR&D recovery. But dual-use companies qualify for little if any IR&D recovery and are reluctant to do contract R&D. The government owns the rights to data generated by contract R&D so that it can keep the subsequent phases of a project competitive by making a data package available to all bidders. But companies that live by their innovation in the commercial market see this process as offering their trade secrets to the competition. DoD procedures provide the winner of a development contract poor profit margins, no guarantee of a continuing relationship with DoD, and little incentive to innovate and provide a superior product.

Some industries, like advanced composites, are currently so closely tied to the defense business that they are apparently willing to live with these problems. But they worry that their competitive position may be damaged as the commercial market develops. At the other extreme, the companies that produce fiber optics are reluctant to get involved in a defense market they see as always being a small part of their business: they do not necessarily see the potential payoff as worth the aggravation.

While the small amount of military fiber optics business might be seen as evidence that the industry is not really important to defense, some within the DoD see it as a critical new technology for future systems, one in which defense could gain tremendously just by exploiting what has been and is being developed in the commercial sector. But DoD has been generally slow in adopting fiber optic technology. Program managers have much to lose by inserting risky new technologies which may delay schedules and increase costs, but little to gain because the advantages of the substitution will usually become apparent only on someone else's watch.

In the software industry, the divergence between government and commercial practices has been enough to produce separate defense and commercial businesses that often do not share technology. The procedures, policies, and management of large-scale systems in the military and civilian sectors diverge starting with requirements definition, continuing in the development or acquisition of software, and throughout the entire life cycle of the software. This restricts the flow of leading-edge technology from defense into the commercial sector and reduces DoD access to readily available commercial products. Most of the differences can be attributed to the policies, regulations, standards, and directives mandated by DoD. DoD software requirements are more rigid than their commercial counterparts. Defense systems tend to be overwhelmingly custom built, while commercial systems will use as much off-the-shelf technology as possible. Software companies are particularly concerned about data rights, which they see as critical to competitiveness. Companies are reluctant to deal under DoD restictions; in their eyes the government would be taking and possibly giving to their competitors the very basis of their business.

International Competitiveness and the Health of U.S. Industries

The Department of Defense has been concerned for some time about the implications for defense of deteriorating competitive positions of U.S. manufacturing companies in the international market.[20] The government is also concerned from a wider perspective that this trend is weakening and undermining the U.S. economy. DoD shares the concern that a weakening economy and a drain of resources into purchases of foreign goods will reduce money available to produce defense equipment, but its primary concern is the continuing availability of necessary items and technology.

The government does not as yet have a policy regarding dependence on foreign sources for defense material and technology, let alone a game plan for implementing such a policy. The Undersecretary of Defense for Acquisition has recommended a plan to bolster defense-related manufacturing in the United States.[21] The report detailing that plan does not make a statement on how much foreign dependence is tolerable, although it does imply that some is unavoidable.

The complexity of the problem is illustrated by the issue of cooperative development and production of defense equipment with the European NATO Allies. It has been long-standing U.S. policy to encourage multinational procurement of similar defense equipment to foster commonality, to get the best equipment into the forces of all the Allies, to save money, and recently, to exploit a broad multinational technology base. In recent years the Defense Department has made great progress in generating international memoranda of understanding for joint development, with the help of initiatives like the Nunn Amendment. But as the Europeans have become more interested in cooperative developments, they have also sought a greater share in generating the technology and a larger market share for their defense industries. Interest by U.S. companies in joint ventures with Europeans has been spurred, in part, by fears that several trends in European thinking could sharply curtail their sales in Europe. Thus, the cooperative programs are a two-edged sword helping U.S. sales in Europe while stimulating European sales to the United States; and helping U.S. defense policy in general, while both helping and hindering the maintenance of the U.S. defense industrial technology base. Crafting a workable policy will be a tricky job.

There are three basic policy choices:

- demand that anything that goes into defense equipment be built in the U.S. from U.S.-sourced components, taking whatever measures are necessary to ensure that all

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[20] For examples, see Defense Science Board, "Report of the Defense Science Board Task Force on Defense Semiconductor Dependency," prepared for the Office of the Under Secretary of Defense for Acquisition, February 1987; Report to the Secretary of Defense by the Under Secretary for Acquisition, "Bolstering Defense Industrial Competitiveness: Preserving Our Heritage, the Industrial Base, Securing Our Future" (Washington, DC: Department of Defense, 1988); and Martin Libicki, *Industrial Strength Defense: A Disquisition on Manufacturing, Surge, and War* (Washington, DC: National Defense University, 1986). See also, U.S. Congress, Office of Technology Assessment, *Paying the Bill: Manufacturing and America's Trade Deficit*, OTA-ITE-390 (Springfield, VA: National Technical Information Service, June 1988).

[21] See "Bolstering Defense Industrial Competitiveness," op. cit., footnote 12.

the necessary industries are alive and well in the United States;
- let the market dictate which industries will be healthy in the United States and look only for the best deals wherever they can be found worldwide; or
- choose some industries that have to be located in the United States, take appropriate measures to ensure that, and let the rest go with the market.

The first and third require some sort of intervention in the international economy, either supporting the international competitiveness of U.S. companies or protecting, supporting, and subsidizing U.S. companies that cannot otherwise survive. Another approach is to design nothing into U.S. defense systems that cannot be domestically sourced. But this cuts off a great deal of modern technology, a Western strength. In making these choices, the United States will have to decide how dependent we can afford to be, and how much independence we are willing to pay for. If the United States demands self-sufficiency without taking measures to keep U.S. companies alive and competitive, the list of technologies available for defense systems is likely to decrease as time goes on.

It will be necessary to decide how to treat dependence on various nations. There are significant differences in being dependent on Canada (already defined as part of the North American industrial base), Britain, our other NATO allies, Mexico, Japan, Korea, etc. U.S. and Canadian companies are closely intertwined. Despite the recent controversy over the trade agreement and other arguments, we are each other's largest trading partners. Canada is also a NATO ally with a common security interest. The chances of being cut off from Canadian sources either by policy or by hostile act are minimal. We are also close to our European Allies; much of our defense equipment is bought to defend them. But we are separated from Europe by an ocean, and they have not always supported U.S. military actions. Other nations are much less tightly tied to the United States.

The high-technology economy is an international one and responds to international market forces. These forces are likely to continue to move industries offshore despite U.S. efforts to will (or legislate) them to stay. In the vast majority of cases, defense business is far too small to provide the necessary clout, particularly when faced with other nations that manipulate their civilian markets to keep their companies healthy. Competition comes from Japan, the smaller Asian nations—Korea, Taiwan, Singapore, etc.—and Western Europe. The Europeans are taking dramatic steps to improve their international competitive position, particularly in high technology industries. These include the economic integration of the EC in 1992, and the funding and encouragement of large cooperative R&D projects.

Although all industries are different, the plight of the fiber optics industry is illustrative. While healthy in the United States, it faces increasingly stiff competition at home and continuing difficulties abroad stemming from limited access to foreign markets. Both the Europeans and the Japanese are making major pushes in fiber optics and photonics in general. U.S. technology and production costs are at least competitive. But while U.S. producers have been largely excluded from some important foreign markets, the U.S. market remains open to foreign vendors. Japanese companies can sell in foreign markets at low prices because their government has discouraged foreign competition in Japan where prices are kept artificially high. The closed domestic market supports overseas competitiveness.

The U.S. software industry faces a different sort of challenge. It is currently strong and competitive, but the rapid growth in worldwide demand for software threatens to outstrip the capacity of U.S. firms to meet it, leaving a large opening for foreign firms to penetrate the market. Japan, France, the United Kingdom, Korea, Singapore, Taiwan, and India have the capacity to penetrate the global market. And many of these nations have trade policies that either discourage sales by U.S. companies or fail to protect the intellectual property rights of those companies: "pirated" software is becoming a major problem. Moreover, the Japanese are making rapid strides in turning software design from art to manufacture, building software factories to increase productivity dramatically.

Internationalization of Industries

Efforts to protect and nurture U.S. companies will be complicated by trends toward internationalization in high-technology industries. Examples are found in the advanced composites industry in which many of the firms that appear to be American—because they have American names or U.S. facilities—are actually owned by foreign companies and in the fiber optics business where international joint ventures are used to get into otherwise closed markets. International ownership, vertical and horizontal integration, and international siting make it difficult to define in any convincing way what an American company is. Moreover, the sequence of steps that leads to a final product often crosses international boundaries many times and shifts as prices and availability of components shifts. Is a Pontiac built in Korea any more or less an American product than a Honda made in the United States or a Chevrolet/Toyota assembled in California from U.S. and Japanese parts?

Difficulties in identifying U.S. companies will produce difficulties in writing legislation to protect them or establishing DoD policy to encourage the growth of important domestic industries. Foreign plants owned by U.S companies, U.S. plants owned by foreign companies, joint ownership, and joint ventures all offer different sets of problems.

Formulating Policy

These trends toward internationalization will complicate difficult issues that Congress and the Administration are already facing. Paramount among these is to decide whether the U.S. Government will play a major role in encouraging and supporting U.S. commercial business and industry, or whether—almost unique among the governments of major nations—it will continue to remain more or less aloof, confining its activities to a few international trade negotiations. Other governments encourage the development of commercial technology and associated industry, help to foster a domestic situation conducive to growth, and support aggressive overseas marketing.

Having decided government's role, the next issue would be to define goals. These might include:

- keeping key nondefense manufacture and development in the United States,
- keeping manufacture and development in the hands of U.S.-based (or U.S.-owned) companies;
- preserving some portion of the U.S. market for U.S.-based (or U.S.-owned) companies; and
- gaining access to foreign markets for U.S. firms.

Defining such goals will entail arriving at a working definition of a U.S. company, or at least of how location and ownership affect U.S. national security interests.

It would be necessary to decide how large a role defense needs would play in deciding which industries are in need of government attention. This decision would have to balance the problems of foreign dependence against the risk of diminished access to foreign technology and manufacture. It would also have to consider how much the United States is willing to pay to buy domestically that which may be available at a lower price elsewhere. The lessons of "low-priced oil" from the Persian Gulf are instructive here. Determining the acceptable degree of offshore dependence for defense equipment will necessitate deciding the level of componentry which DoD would have to specify as coming from domestic sources. For example, is it sufficient to require that systems or subsystems be domestically sourced, or does DoD have to assure that some or all of the components are made in the U.S.A.? This decision would dictate the level at which DoD would need visibility into the manufacturing process and have to keep a data base on suppliers.

Whatever the goals are, Congress will have to decide what levers can be pulled to make those attainable. In most cases, simply controlling defense procurement will not be enough to influence the industry: it may ultimately lead to an inefficient, backward, protected industry that is incapable of competing on the world market. Such an industry might only be capable of providing DoD with obsolete technology or overpriced products. The government has the option of getting more deeply involved in stimulating the development of technology for commercial ends, including making government R&D facilities more available and providing greater incentives for corporate investment. Yet another option is to formulate a strategy—as Japan and other nations have—for controlling access to critical U.S. commercial markets in order to preserve and support domestic industrial capabilities. A third policy lever that can be manipulated, but not totally controlled, is the cost and availability of capital for conducting R&D. Major technological developments are capital intensive, with costs measured in the hundreds of millions to billions of dollars. European and Japanese companies pay less to borrow money than do U.S. companies—far less in the case of the Japanese. This allows them to carry on more projects simultaneously, and to sell the resultant products at lower prices than those of their U.S. competitors, putting U.S. companies at a competitive disadvantage.

NOTE: Copies of the report "Holding the Edge: Maintaining the Defense Technology Base" can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325, GPO stock No. 052-003-01150-6.

Dr. SHAW. Thank you.

Before turning to the specific topics of today's hearings, I would like to first make a few general observations about the state of defense technology base.

First of all, we are not dealing with a defense technology base that is in crisis. It is large and broadly based. It produces much technology that is useful in developing weapons and other systems. Nevertheless, it does face some major problems, and these problems are going to be aggravated by the recent trends that Dr. Fields just enunciated: declining defense budgets, at least in real terms, and the erosion of the high technology industries in the United States.

Inattention to these problems can lead to serious erosion in our ability to maintain a meaningful technological edge over our potential adversaries; and again, that is what the goal is.

Now Congress bears some of the responsibility for many of these problems. The accumulated actions of past Congresses which were usually taken for very good reasons have helped to create a cumbersome system for developing technology that, simply put, lacks the flexibility to respond well to rapid movements in modern research and development.

Although Congress has helped cause the problems, it can also help solve them, but it is not going to be easy. As we see it, some difficult decisions are going to have to be made; for example, opting to deemphasize goals such as competition, accountability, constitutent interests and even environmental protection in order to achieve more efficient development. Decisions like that will not be simple.

Moreover, correct policy direction will not always be clear, and it will often be necessary to make a reasoned decision, take the course and hope for the best. I reiterate, there will be no clear cut, simple solutions to the problems.

The major topics of this hearing, the critical technologies plan, dual use technology, foreign dependence, and interagency coordination in R&D are all closely related. Over half of the critical technologies identified by DOD are dual use technologies and, as such, the subject of foreign competition and international market forces.

Accordingly, any policy approach to maintaining these technologies will involve a number of government agencies in addition to DOD.

DOD, along with the Energy Department, has done a very credible job of compiling a list of critical technologies. By itself, this list is of limited practical use. What is important is the process that the critical technologies plan should start; that is, putting the programs in place to ensure that these technologies are adequate explored and developed and periodically updating the list itself as appropriate.

In the report on critical technologies, figure 1 illustrates the DOD science and technologies strategic planning process. It is quite complicated, shows a great number of players, and the text says it omits many more. It does not, however, indicate who is in charge of the process. That is a central issue for the entire DOD technology base program.

Authority to plan strategically has to be vested somewhere. As we see it, there are three basic options. The services, DARPA and SDIO can plan their own approaches and continue to dominate the process. Alternatively, OSD can lead the planning process, or some other organization like the Joint Directors of Laboratories could undertake the task.

The present situation emphasizes a bottom up approach. It places technology planning closest to the hands of the technology users, but in doing so it sacrifices broad consistency and coordination of the entire S&T program.

The critical technologies were chosen in part because they have broad applications across service lines. As we see it, it would be somewhat inconsistent, having done the selection of the critical technologies from a DOD-wide perspective to take a more decentralized approach to planning their development. Moreover, if these technologies are truly important, that ought to have a high level advocate within the Department.

As I said, a key feature of the critical technologies list is that between 12 and 14 depending upon how you count—of the 22 are dual use technologies. In developing the dual use technologies, DOD can benefit from the efforts of the civilian consumer sector, which can often invests more resources in hot areas of technology than DOD does.

DOD's efforts could in principle benefit the Nation's economy; but for this to happen, it is going to be necessary for strategic planning to take into account the dual use nature of the technology. This implies that planning should take place in such a way that DOD's work can at least be coordinated with the efforts of other government agencies, particularly those that understand the interest and posture of the civilian sector of the national economy.

In the long run, we can envision a situation in which civilian and defense R&D are better integrated and coordinated than they are today. DOD would pursue high risk, far future technologies while exploiting the private sector's talents for rapid innovation and transition of the products. For now, a major question is how much DOD can and should use its assets to influence the direction in which dual use technology is developed.

Decades ago, the United States dominated high technology industry, and defense led most technological advances. As you just heard, things are very different today. Although DOD spends about $9 billion per year on its science and technology programs, the amount of money it can invest in any specific technology is often small, especially relative to civilian industry both domestic and foreign.

This gives DOD little ability to influence the direction of developments fueled by enormous amounts of capital that are generated by commercial markets and less ability to keep important industries domestic. Marketing opportunities and not DOD plans determine the overall direction of development in an increasing number of important technologies. It is extremely unlikely that DOD will regain the leadership position it once held, but while increasingly unable to drive the general direction of technology, the Defense Department must nonetheless invest its limited resources to try to ensure that specific areas of development that are important to its needs are not ignored.

The dual use character of much critical technology almost guarantees that agencies other than DOD will be involved in their development. As I said before, the issue is how best to coordinate or integrate these efforts.

In the abstract, a high level strategic planning effort would seem to be called for, but there is to date no strong consensus that high level planning is a good idea within DOD, let alone among DOD and other Federal agencies.

Nevertheless, it seems that it is not too early to at least study this issue to try to understand how the process might be accomplished and what bureaucratic institutions might have to be involved.

Of course, much of the dual use technology now comes from foreign sources, and the expectation is this is likely to increase. The Nation does not have a coherent policy toward foreign dependence either from a military perspective or from a commercial one. Within the reality of a multi-polar technological world we will have to decide the degree to which we can be dependent on various other nations for vital technology as well as what we are willing and able to do and how much we can spend to avoid foreign dependence.

This policy is going to have to distinguish intelligently on the basis of factors such as foreign siting, foreign ownership and the specific nations with which we are dealing. We cannot treat all other nations the same.

It should also take into account business arrangements that do not respect national boundaries as well as the industrial policies of other nations.

But most importantly, it will have to be made in the context of industrial reality. Powerful forces are moving industries offshore despite our efforts to get them to stay. Just deciding that certain industries must be domestic will not be enough. In some cases, even drastic measures may not be enough to enforce a decision.

To be successful, Government policies will most likely have to be crafted to exploit and steer market forces rather than to oppose them. As the problem goes well beyond defense concerns, the solution will also have to do that.

Now I would expect that both the Energy Department's contractor-run national laboratories and the services' Government-owned and operated labs will be involved in developing the critical technologies. The DOE national labs have two advantages. They have large multi-disciplinary staffs that can be, and are often eager to be, moved into work in new areas of technology as those areas develop. They also have the requisite management flexibility to do that.

DOD's labs generally suffer on both accounts. This is not to say that the service laboratories do not have good people. Some of their teams are truly excellent, but their efforts will be impeded by their general structure and by their management systems.

These factors will hold for the critical technologies as well as all other areas of investigation. Furthermore, based on past performance, most of the work done by the DOE labs will probably be done in-house, but a substantial part of what is done in the defense laboratories will be contracted out.

Let me hasten to say that the Energy and Defense laboratories should be viewed as complementary national assets and not competitors for the work. We do need both of them. The issue here is how to improve the contribution that the service labs can make.

Our analysis indicates that the Congress ought to consider seriously both restructuring the DOD lab system and reforming the management system under which these facilities operate.

While I would be hard put to say that the DOD labs are in a state of crisis, certainly their ability to hire and retain necessary scientific and technical talent is declining alarmingly.

The development of the critical technologies, especially those that are dual use, are going to require the involvement of high technology companies, and many of these now do little business with the Defense Department. Others are not even interested in Government contracts. Simply, the Government will have to do business with companies that do not really need its business.

We have a system that discourages these companies from dealing with the Government because the Government system of doing business is completely different from the mode in which they usually operate.

DOD, with the help of the Congress, has erected barriers to doing business with innovative small and medium size companies, and even some fairly large ones are less than enthusiastic about Government work. In our understanding, the officers of lucrative companies with high profit margins in highly competitive industries are not really enthusiastic about dealing with a customer that demands the services of their best people, gives their trade secrets to the competition, regulates their profits, requires them to set up a whole new accounting procedure at a cost that might exceed their profits, audits their books several times, and might even wind up sending some of their officers to jail for violating some obscure rule they might not have known existed in the first place.

Though it is just a bit of exaggeration, that is how the Government appears to many corporate outsiders to whom we have spoken. In fact, we have met corporate managers who want to do business with the Defense Department, who in fact feel a patriotic duty to get their technology into defense applications, but they have a difficult time convincing their corporate boards that Government business is in the interest of the company.

In addition to erecting barriers to obtaining civil technology, the procurement system is a major contributor to the long time it takes to get the new technology into the field. The system serves a number of goals other than efficient procurement, and the need to satisfy this imbalance and often competing demands stretches the process out.

It seems almost certain that reforming the system to focus more on efficient procurement would greatly speed things up but, as I said before, at the cost of these other goals like accountability, fairness, competitiveness, environmental protection, and the protection of public funds. These are also important national goals.

Other contributors to delays are the transition of technology from development to engineering and program stretchouts due to budgetary changes. Transition is a very complex technical problem not likely to be amenable to direct congressional action, but budgetary controls certainly are within the power of Congress.

As you know better than I, producing consistent budgeting and program profiles is a very difficult proposition.

In this short statement I have touched only briefly on these complex issues. I would be happy to elaborate on them in a question and answer period. Several of my colleagues who worked on this project with me are seated here in the audience, and with your permission I might call on them to help me out.

Thank you.

[The prepared statement of Mr. Shaw follows:]

PREPARED STATEMENT OF
DR. ALAN SHAW
PROGRAM MANAGER, OFFICE OF RECHNOLOGY ASSESSMENT

MR CHAIRMAN:

Thank you for the opportunity to testify before this subcommittee. My name is Alan Shaw. I am the manager of OTA's International Security and Commerce program. I directed the assessment "Maintaining the Defense Technology Base."

In this statement, I would like to summarize briefly some of the major findings of the OTA report "Holding the Edge: Maintaining the Defense Technology Base", as they pertain to the topics of this hearing. As you are aware, the OTA report is rather far-ranging, covering several separate but related topics the committee asked OTA to investigate. Rather than spend a long time summarizing the report, I request that the summary be inserted into the record in lieu of a prepared statement.

Before turning to the specific topics of today's hearing, I will first make some general observations about the state of the defense technology base.

The defense technology base is not in crisis. It is large and broadly based, and produces much technology that is useful in developing weapons and other defense systems. But it does face major problems. These problems will be aggravated by recent trends such as declining defense budgets and the erosion of high technology industries in the United States. Inattention to these problems could lead to serious erosion in our ability to maintain a meaningful technological edge over potential adversaries. Congress bears some of the responsibility for many of these problems. The accumulated actions of past Congresses--usually taken for good reasons--have helped to create a cumbersome system for developing technology that, simply put, lacks the flexibility to respond well to rapid movements in modern research and development. Although Congress has helped cause the problems, it can also help solve them; but it will not be easy. Difficult decisions will have to be made--for example, opting to deemphasize goals such as fairness, competition, accountability, constituent interessts and even environmental protection in order to achieve more efficient development. Moreover, the correct policy direction will not always be clear. It will often be necessary to make a reasoned decision and hope for the best.

The major topics of this hearing--the critical technologies plan; dual-use technology; foreign dependence; and interagency coordination in R&D--are all closely related. Over half of the critical technologies identified by DoD are dual-use, and as such are subject to foreign competition and international market forces. Accordingly, any policy approach to maintaining such technologies will involve a number of government agencies, in addition to DoD. With this in mind, I would like to comment briefly on a few of the topics suggested by your staff:

1. formulating a DoD strategy for pursuing the critical technologies;
2. the role of DoD and other agencies in fostering dual-use technology;
3. foreign sources of dual-use technology;
4. the role of government labs in developing the critical technologies;
5. procurement reforms that could permit faster involvement of high technology companies;
6. effecting a quicker transition of technology into defense systems.

Formulating DoD Strategy for Pursuing Critical Technologies

DoD, along with DOE, has done a credible job of compiling a list of critical technologies. But by itself, this list is of limited practical use. What is important is the process that the Critical Technologies Plan could start: putting the programs in place to ensure that these technologies are adequately explored and developed, and periodically updating the list itself as appropriate. Figure 1 of the Critical Technologies report illustrates the DoD Science and Technology Strategic Planning process. It shows a great number of players and omits many more, but it does not indicate who is in charge. That is a central issue for the entire DoD technology base program.

Authority to plan strategically should be vested somewhere. There are three basic options. The Services, DARPA, and SDIO can plan their own approaches and continue to dominate the process. Alternatively, OSD can lead the planning process, or some other organization like the Joint Directors of Laboratories can undertake the task. The present situation emphasizes the bottom-up approach. It places technology planning closest to the hands of the technology users, but sacrifices broad consistency and coordination of the entire DoD Science and Technology Program. The critical technologies were chosen, in part, because they have broad applications across Service lines. It would be somewhat inconsistent, having done the selection of the critical technologies from a DoD-wide perspective, to take a more decentralized approach to planning their development. Moreover, if these technologies are truly important, they ought to have a high level advocate within the Department.

A key feature of the critical technologies list is that 12 to 14 of the 22 are dual-use technologies, technologies with applications beyond defense. In developing dual-use technologies, DoD can benefit from the efforts of the civilian consumer sector, which can often invest more resources in "hot" areas of technology than DoD does. And DoD's efforts could, in principle, benefit the nation's economy. But for this to happen, it will be necessary for strategic planning to take into account the dual-use nature of the technology. This implies it ought to take place in such a way that DoD's work can at least be coordinated with the efforts of other government agencies, particularly those that understand the interests and posture of the civilian sector of the national economy.

The Role of DoD and Other Government Agencies in Fostering Dual-Use Technology

In the long term, one can envision a situation in which civilian and defense R&D are far better integrated and coordinated than they are today: DoD would pursue high risk, far future technologies, while exploiting the private sector's talents for rapid innovation and transition into products. But for now, a major question is how much DoD can and should use its assets to influence the direction in which dual-use technologies develop.

Decades ago, the U.S. dominated high technology industry and defense led most technological advances. Things are very different today. Although DoD spends about $9 billion per year on its Science and Technology programs, the amount of money it can invest in any specific technology is often small relative to what civilian industry--domestic and foreign--invests. This gives DoD little ability to influence the direction of developments fueled by enormous amounts of capital generated by the commercial markets, and less ability to keep industries domestic. Marketing opportunities, not DoD planners, determine the overall direction of development in an increasing number of important technologies. It is extremely unlikely that DoD will regain the leadership position it once held. But while increasingly unable to drive the general direction of technology, DoD must nonethless invest its limited resources to try to ensure that specific areas of development that are important to its needs aren't ignored.

The dual-use character of much critical technology almost guarantees that agencies other than DoD will be involved in their developement. The issue is how best to coordinate (or integrate) these efforts. In the abstract, a high level strategic planning effort would seem to be called for. But there is to date no strong consensus that high-level planning is a good idea within DoD, let alone among DoD and other federal agencies. Neverthless, it is not too early to at least study the issue, to try to understand how the process might be accomplished and what bureaucratic institutions might be involved.

Foreign Sources of Dual-Use Technology

Much dual-use technology now comes from foreign sources, and this is likely to increase. Yet the U.S. does not as yet have a coherent policy toward foreign dependence--either from a military perspective or from a commercial one. Within the reality of a multi-polar technological world, we will have to decide the degree to which we can be dependent on various other nations for vital technology, as well as what we are willing and able to do--and how much we can spend--to avoid foreign dependence. This policy will have to distinguish intelligently on the basis of factors such as foreign siting, foreign ownership, and the specific nation in question. It should take into account business arrangements that don't respect national boundaries, as well as the industrial policies of other nations. But most importantly, it will have to be made in the context of industrial reality: powerful forces are moving industries offshore despite our efforts to get them to stay. Just deciding that certain industries must be domestic is not enough. In some cases even drastic measures may not be enough to enforce the decision. To be successful, government policies will most likely have to be crafted to exploit and steer market forces rather than oppose them. The problem goes well beyond defense concerns, and the solution will have to do so as well.

Role of Government Laboratories in Developing Critical Technologies

I would expect that both the Energy Department's contractor run laboratories and the Service's government-owned and operated labs will be involved in developing the critical technologies. The DOE national labs have the twin advantages of: (1) large multi-disciplinary staffs that can be--and are eager to be--moved into work in new areas of technology as they develop; and (2) the requisite management flexibility. DoD's labs generally suffer on both accounts. That is not to say that Service laboratories don't have good people--some teams are truly excellent--but their efforts will be impeded by their general structure and by their management systems. These factors will hold for the critical technologies as well as other areas of investigation.

Furthermore, based on past performance, while most of the work done by DOE labs will be done in-house, a substantial part--probably the great majority--of what is done in DoD's labs will be contracted out.

Energy and Defense laboratories ought to be viewed as complementary national assets, not as competitors for the work. The issue is how to improve the contribution the Service laboratories can make. OTA's analysis indicates that the Congress ought to consider seriously both restructuring the DoD lab system, and reforming the management system under which these facilities operate. While I would be hard put to say that the DoD labs are in a state of crisis, their ability to hire and retain the necessary scientific and technical talent is declining alarmingly.

Procurement Reforms to Permit Faster Involvement of High Technology Companies

The development of the critical technologies, particularly those that are dual-use, will require the involvement of high technology companies. Many of these do little business with the Defense Department. Others are not interested in government contracts. The government will have to do business with companies that don't really need its business. And these companies are discouraged from dealing with the government: the government system of doing business is completely different from the mode in which they usually operate.

DoD, with the help of Congress, has erected barriers to doing business with innovativa small and medium-sized companies. Even some fairly large ones are less than enthusiastic about government work. Officers of lucrative companies with high profit margins in highly competitive industries are not enthusiastic about a customer that demands the services of their best people, gives their trade secrets to the competition, regulates their profits, requires them to set up whole new accounting procedures at a cost that might exceed that profit, audits their books several times, and might send them to jail for violating an obscure rule they might never have known existed. With just a bit of exaggeration, that's how government business appears to many corporate "outsiders".

We have met corporate managers who want to do business with DoD, who feel a patriotic duty to get their technology into defense applications. But they have a difficult time convincing their corporate boards that government business is in the interest of the company.

Reducing the Time to Field

In addition to erecting barriers to obtaining civil technology, the procurement system is a major contributor to the long time necessary to get new technology into the field. The system serves a number of goals other than efficient procurement, and the need to satisfy these and balance their often-competing demands stretches the process out. It seems almost certain that reforming the system to focus much more on efficient procurement would greatly speed things up, but at the cost of these other goals--like accountability, fairness, competitiveness, environmental protection, and protection of public funds--that are also important national goals. Thus, Congress faces a difficult decision.

Other contributors to delays are the transition of technology from development into engineering, and program stretchouts due to budgetary changes. The former is a complex technical problem not likely to be amenable to Congressional action. Budgetary controls are within Congress's power, but as you know better than I, producing consistent budgeting and program profiles is a very difficult proposition.

In this short statement I have only touched briefly on these complex issues. I will be happy to elaborate on them in the question and answer period. Several of my colleagues are seated behind me. With your permission, I may call on them to help me answer your questions.

THANK YOU.

Senator **Bingaman**. Thank you very much.

Before we go to any questions, let me call on Dr. Hecker to make any statement that he would like to make about this complex of issues.

STATEMENT OF DR. SIEGFRIED S. HECKER, DIRECTOR, LOS ALAMOS NATIONAL LABORATORY

Dr. **Hecker**. Thank you, Senator Bingaman. I tried to bring you some sunshine from New Mexico, but it did not work out.

Senator **Bingaman**. I wish you had done that.

Dr. **Hecker**. Senator Glenn, it is good to be here this morning. Thank you for the opportunity to comment on the critical technologies plan and to provide my assessment of the Nation's defense technology base and how it might be improved.

DOD did an excellent job in preparing the first critical technologies plan. I think it also properly recognized that any single list does not constitute such a plan, and I agree with Dr. Shaw that the critical technologies must be reevaluated continuously, and in fact they must be integrated into an overall science and technology plan along with other supportive technologies, as Dr. Fields mentioned.

The Department of Energy, in addition to sharing many of the same critical technologies listed in this report, also has a number of special requirements that result because of its nuclear weapons mission; requirements such as actinide materials or materials under extreme conditions. I will not discuss those today but address the broader question of the defense technology base.

At your subcommittee hearing last March, I presented a comprehensive plan of how the DOE laboratories could enhance their contributions to the defense technology base. I also pointed out that the three DOE weapons laboratories—namely, Los Alamos, Lawrence Livermore and Sandia National Laboratories—already contribute substantially to DOD technologies and that today the Department of Defense supports about $600 million worth of R&D at these three laboratories for nonnuclear weapons-related activities.

What I would like to do today is to address the more specific case of critical technologies rather than the broad-based comments that I made last year. Again, I would like to do it from the perspective of what the DOE laboratories could do to contribute. I recognize that is only a small slice of the problem as Drs. Fields and Shaw have already pointed out.

The approach that I would like to take is that I believe there are certain technologies that are or will remain critical for many decades because they either drive or they underpin more specific technologies. These critical technologies require special investment strategy to ensure that there is stability, perseverance and the attention of a first-rate institution that is focused on a continuity of effort to make these technologies go. I believe that it is in this area that the DOE laboratories can make a very special contribution to the defense technology base.

Let me give you just one such example, and that is supercomputing. I believe it cross-cuts many of the 22 critical technologies that were listed. In fact, the 1985 White House Science Council report stated that the bottom line is that any country that seeks to control its future must effectively exploit high performance computing. The country that aspires to military leadership must dominate, if not control it. The country seeking economic strength must lead in the development and application of high performance computing in industry and research.

At Los Alamos we have dedicated ourselves to these goals for the past four decades. The nature of our institution and our assignment has allowed us to remain the foremost scientific computing center in the world and contribute to the U.S. competitive position.

After giving you some specific recommendations on supercomputing, I will also mention two other technologies where this long-term strategy is extremely important; and that is superconductivity and material synthesis and processing. Let me talk about supercomputing first for a bit.

Our reliance on supercomputing—that is, the large scale computations with the most powerful computers of today—will continue to increase in virtually all areas of national security and economic competitiveness. Today the United States still leads the world in supercomputing; however, the Japanese are threatening that dominance in two ways.

First of all, the performance of Japanese computers at the single processor level today is roughly the same as that of the newest and most powerful U.S. computer; that is, the Cray Y-MP. If the Japanese meet their goals, they will have machines that are 5 to 15 times more powerful than their current models in the next 1 to 2 years.

The United States still enjoys an overall advantage in supercomputing because of our lead in multiple processor machines.

The second concern is the one that was already mentioned by Dr. Fields, and that is the question of foreign dependency. In fact, Cray Research, Incorporated depends critically upon Fujitsu for many of its hardware components. It also appears that the most advanced gallium-arsenide chips for Seymour Cray's Cray-3, the next generation of supercomputers, are also Japanese. This type of dependency makes U.S. competitiveness unacceptably dependent on Japanese suppliers who at the same time are also our staunchest supercomputer competitors.

The Office of Science and Technology Policy has been coordinating a national high performance computing initiative to extend the U.S. leadership in high performance computing and also to encourage U.S. sources of production. This initiative would require significant new funds over the next 5 years.

I believe that a national initiative is warranted because of the overriding importance of computing. Furthermore, the DOE laboratories in general and Los Alamos in particular can play an important role. To better appreciate such a role, let me briefly summarize the contributions of Los Alamos in computing over the past four decades.

We take the view that supercomputing originated with what was called the Los Alamos problem; that is, the prediction and performance of the first atomic bomb during the Manhattan Project. The first attempts at supercomputing were made by organized teams of operators with arrays of mechanical desktop calculators.

In 1945, Los Alamos researchers, running their problem, were the first users of the University of Pennsylvania ENIAC, the world's first large scale electronic computer. Shortly thereafter, Los Alamos implemented the John von Neumann stored program architecture into its own MANIAC computer with which it ran the first large-scale hydrodynamic calculations for the hydrogen bomb.

IBM produced its first von Neumann machine with capabilities similar to the Los Alamos MANIAC, the IBM Model 701, in 1953. The serial number one was installed at Los Alamos. This began a Cray of Los Alamos computer vendor cooperation that still holds today. In fact, the IBM connection lasted to the mid 1960s, at which time Los Alamos began to work closely with Control Data Corporation, whose machines designed by Seymour Cray became the fastest. In time, Los Alamos had four of the Control Data Corporation's first supercomputers at Los Alamos.

The startup company, Cray Research, Incorporated, announced its first Cray-1 supercomputer in 1975. The first Cray-1 was installed at Los Alamos for testing and evaluation in 1976. The close collaboration between Cray, who was certainly the epitome of the entrepreneurial supplier, and Los Alamos, a sophisticated and demanding user, was one of the keys to success of Cray supercomputers.

Since then, a succession of increasingly capable Cray supercomputers has provided the computational power the laboratory has continued to need in ever-increasing quantity. The Cray-1 was followed by the Cray X-MPs and then most recently the two Cray Y-MPs at Los Alamos.

Today, in addition to our continued collaboration with Cray Research, Los Alamos is once again working closely with IBM in its quest to develop what may be the next generation supercomputer. It is clear to us, however, that dramatic improvements in supercomputing have to come from massively parallel processing where hundreds or even thousands of processors cooperate to solve a single problem. The challenge is to design efficient hardware and software to be able to achieve this potential.

To meet this and other computing challenges, Los Alamos has established what we call the Advanced Computing Laboratory to investigate parallel computing, also high speed networking, distributive computing and visualization. The current focus of this laboratory is a second generation Connection Machine, the CM-2, which is built by Thinking Machines. It actually has 65,536 processors and 512 megabytes of memory. Let me add that it was DARPA that sponsored the development of Connection Machines.

Very high speed networking at a gigabyte or more is also being pursued in our Advanced Computing Laboratory. We are leading an effort with Thinking Machines right now to develop a high speed channel that would interconnect several large elements of our existing computer network, including the Cray machines, with the Connection Machine 2.

The Advanced Computing Laboratory as Los Alamos is also teamed with Rice University, with Cal Tech and with Argonne National Laboratory in the National Science Foundation Science and Technology Center, which focuses on parallel computing.

Now I have walked you through this brief history of Los Alamos and its involvement in supercomputing to make the point that to stay ahead in a technology as critical as supercomputing, it takes an incredible dedication that is often measured in decades and not just in 1 year or even 3-year funding cycles.

I encourage Congress to support the National High Performance Computing Initiative. I think the Federal agencies such as DOD, DARPA, DOE, NSF, NASA and the National Security Agency all must play a role in that initiative.

I believe that DOE and its laboratories must be major contributors to such an initiative. The way I see it is that they provide the market pull of the sophisticated user; also a record of close working relationship with computer vendors as I have just mentioned; a potential for multiple payoffs to both defense as well as civilian sector problems; an ability to further the state of the art in hardware and software technology; and a hand in training human resources of the future through our interactions with students.

Let me turn to the second topic that I mentioned, and that is superconductivity. Since the discovery of high temperature ceramic superconductors, we have all been made aware of the great promise of these materials to revolutionize both the commercial and the military worlds. In the past few years, however, we have also found that it is going to be a very long and hard road to commercialize these materials.

The recent report of the committee to advise the President on High Temperature Superconductivity, the so-called Wise Man's Committee, stated that major commercial exploitation is one or two decades away, so that efforts aimed at practical applications must be sustained over the same period to attain practical results. The committee was concerned that much of the U.S. industrial activity is unlikely to survive what it believed would be a long distance race in a long distance competition with nations such as Japan.

The Wise Men specifically recommended that, first of all, we should strengthen our scientific base with additional investments in superconductivity research at our universities and, second, that one should create superconductivity consortia which comprise research universities, government laboratories and private industry to carry out jointly agreed upon scientific and technical plans aimed at advancing superconductivity in its applications.

I believe the DOE laboratory is ideally suited to participate in such consortia or otherwise contribute to long-range research and technology development. Several of the laboratories have been active in superconductivity research for over three decades and have excellent capabilities in material science and technology which will be required to make progress towards commercialization.

At Los Alamos, for example, we have one of the leading superconductivity research groups in the world. We have not only published many hundreds of papers in superconductivity, but we have been intimately involved in applications including the building and operation of a superconducting magnetic energy storage system for the Bonneville Power Authority.

In 1988, the Department of Energy at our urging established superconductivity pilot centers at three of its laboratories; namely, Los Alamos, Argonne and Oak Ridge National Laboratories. The objective of the pilot centers is to work closely with private industry to develop technologies that will lead to rapid commercialization of high temperature superconductors. The pilot centers will focus on long-term generic precommercial technologies.

A side objective of the pilot centers was to develop a better and more timely mechanism for the DOE laboratories to work with private industry on government-funded and jointly-funded initiatives. The pilot centers have drawn enormous interest from the private sector. Several cooperative agreements have been signed, and several more are being negotiated.

At this point, the pilot centers are struggling to obtain sufficient funding to take advantage of the great interest in the private sector. At Los Alamos, some of our superconductivity work is also sponsored by the Department of Defense, particularly SDIO and DARPA, and we would like to develop a greater synergism between the civilian and the defense-related superconductivity work.

So I believe that the DOE laboratories could contribute significantly more to the DOD superconductivity research and development effort. In fact, the DOE model of the superconductivity pilot centers could be extended to cover defense applications by working with both universities and defense contractors. Such centers could serve the role of consortia aimed at technology development both for military as well as for civilian applications.

Let me turn to the third technology, and that is the general area of materials synthesis and processing. I want to mention this area again because it cross-cuts so many of the 22 critical technologies. Research in material science and engineering in the past few decades has led to a greatly improved understanding of the properties of materials and the relationship of these properties to the microstructure such as the crystal structure or crystal defects.

In addition, many new methods of synthesizing novel materials such as vapor deposition processes or rapid solidification processing are becoming of age. Today we stand on the threshold of atomically engineered materials with tailormade properties for specific applications. In my opinion, a determined effort at creating a more scientific basis for the synthesis and processing of engineered materials is required to get us over this threshold.

In the United States, we now have available computers that permit sophisticated modeling of process variables to design more intelligent processing systems. We have witnessed a revolution in laser-based and other diagnostics that should permit in situ measurements and control of process variables. We now also have an impressive array of materials characterization facilities that permit us to assess the microstructures and properties of the materials that we produce, and we are beginning to develop a better appreciation for the importance of chemistry in synthesis and processing.

What we need to do now is to put it all together to develop this more scientific approach to the synthesis and processing of materials. I want to stress that this approach includes structural materials, let us say, such as composites for airplane skins where mechanical properties are most important, and also electronic materials such as, let us say, gallium-arsenide chips where electronic, electrical, optical or magnetic properties are most important.

Currently, many governmental agencies have programs in material synthesis and processing specific to certain classes of materials that are of interest to them. The DOD, especially DARPA, and the Air Force have been aggressively sponsoring materials processing and manufacturing technologies R&D. The DOE, NASA, Army and Navy also support such effort.

What I would like to see is a bold national effort, perhaps one of establishing a network of 8 to 12 material synthesis and processing centers that can bring together these capabilities of computer modeling, diagnostics, and characterization. Such centers, I believe, would elevate our national scientific base for manufacture of advanced materials.

This initiative would be similar to the DOE national user facilities concept, which is aimed principally at materials characterization that has been established over the past few decades. In my opinion, these facilities have made an enormous impact on the scientific understanding of materials. I think in a similar fashion, such a network of centers for material synthesis and processing would have a great benefit to that area.

I believe that material synthesis and processing centers should be physically located at the appropriate DOE laboratories or universities that have demonstrated the expertise in material synthesis and processing and that also possess the necessary people skills and facilities contributing to computer modeling, diagnostics and characterization.

Many of the DOE laboratories meet these criteria. They not only have the computational resources, laser expertise, but they also house the sophisticated characterization facilities that I mentioned featuring synchrotron light sources, neutron scattering facilities or very high resolution electron microscopes. This would allow them to carefully characterize what they synthesize and process.

The DOE laboratories should be closely linked in any case with universities to ensure that the scientific approach to material synthesis and processing is there and that training of the students is also available.

Such centers should feature a close collaboration with private industry to effect the rapid transition of the scientific synthesis and processing into applications. I envision industrial partnerships very much along the lines of those that we have developed in the superconductivity pilot centers.

So for the purpose of critical defense technology, such an initiative could be sponsored by the Department of Defense perhaps by developing advocacy for this concept within an organization like DARPA. It is my belief, however, that most of the technologies would have an impact on both civilian as well as defense applications; therefore, one could consider sponsorship by multiple Government agencies such as the DOE or the Department of Commerce and NASA along with the Department of Defense.

In summary, let me say that I have concentrated on a few of the technologies that I believe are so critical and crosscut so many of the 22 technologies described that they require decades of dedication and support, and this is where the DOE laboratories with a long history of scientific excellence in their dual civilian and defense roles could make special contributions to assuring the health of the defense technology base.

The three I discuss which I think are particularly critical are supercomputing, superconductivity and material synthesis and processing.

Thank you.

[The prepared statement of Dr. Hecker follows:]

STATEMENT OF
SIEGFRIED S. HECKER
LOS ALAMOS NATIONAL LABORATORY

COMMENTS ON CRITICAL DEFENSE TECHNOLOGIES

Thank you for the opportunity to comment on the Department of Defense's (DoD's) *Critical Technologies Plan* and to provide my assessment of the nation's defense technology base and how it might be improved.

The DoD did an excellent job of preparing the first *Critical Technologies Plan*. It also properly recognized that any single list does not constitute a "plan." Critical technologies must be continually reevaluated, and they must be integrated into a balanced science and technology program with other supportive technologies.

The Department of Energy (DOE), in addition to sharing many of the critical technologies listed in the report, has other special requirements as a result of its nuclear weapons mission. These special requirements include technologies such as actinide materials and behavior of matter under extreme conditions. I will not discuss these today.

Instead, I will focus on the role of the DOE laboratories in contributing to the broader defense technology base.

At your Subcommittee hearing last year (March 18, 1988), I pointed out that the three DOE nuclear weapons laboratories (Los Alamos, Lawrence Livermore, and Sandia National Laboratories) already contribute substantially to DoD technologies. DoD support of nonnuclear weapons technologies at the three laboratories currently stands at $600 million annually. In 1988, I presented a comprehensive plan of how the DOE laboratories could enhance their contributions.

Today, I plan to address the more specific case of critical technologies, but again from the perspective of how the DOE laboratories can contribute.

The DoD's *Critical Technologies Plan* shows milestones out to the year 2000 for 22 technologies. Clearly, progress in developing these technologies and incorporating them into fielded systems will require a long-term commitment.

Certain technologies are or will remain critical for many decades because they either underpin or drive other, more specific, technologies. These critical technologies require a special investment strategy to ensure stability, perseverance, and the attention of first-rate institutions that can provide a continuity of effort. It is in this area that I believe the DOE laboratories can make a special contribution to the defense technology base.

One such example is supercomputing. It crosscuts many of the 22 critical technologies. A 1985 White House Science Council report stated: "...the bottom line is that any country that seeks to control its future must effectively exploit high performance computing. A country that aspires to military leadership must dominate, if not control it. A country seeking economic strength... must lead in the development and application of high performance computing in industry and research."

At Los Alamos, we have dedicated ourselves to these goals for the past four decades. The nature of our institution and our assignment has allowed us to remain the foremost scientific computing center in the world and contribute to the U.S. competitive position.

After giving you some specific recommendations on supercomputing, let me mention at least two other technologies where a long-term strategy of involving the DOE laboratories will bring great benefit to the nation's defense technology base: superconductivity and materials synthesis and processing.

Supercomputing

Our reliance on supercomputing (large-scale computations with the most powerful computers) will continue to increase in virtually all areas of national security and economic competitiveness. Today, the United States still leads the world in supercomputing. However, the Japanese are threatening that dominance in two ways.

First, the performance of the Japanese computers (at the single-processor level) today is roughly the same as that of the newest and most powerful U.S. supercomputer, the Cray Y-MP. If the Japanese meet their goals, they will have machines five to fifteen times more powerful than their current models in the next one to two years. The United States still enjoys overall advantage because of its lead in multiple processor machines.

Second, Cray depends critically upon Fujitsu for many of its hardware components. It also appears that the most advanced gallium-arsenic chips for Seymour Cray's Cray-3 are also Japanese. This type of dependency makes U.S. competitiveness unacceptably dependent on Japanese suppliers, who, at the same time, are our staunchest supercomputer competitors.

The Office of Science and Technology Policy has been coordinating a National High Performance Computing Initiative to extend U.S. leadership in high-performance computing and encourage U.S. sources of production. This initiative would require $1.75 billion of new funds over five years.

I believe that a national initiative is warranted because of the overriding importance of computing. Furthermore, the DOE laboratories in general, and Los Alamos in particular, can play an important role. To better appreciate such a role, let me briefly summarize the contributions Los Alamos has made to computing over the past four decades.

Supercomputing originated with the "Los Alamos Problem"--as predicting the performance of the first atomic bomb was called during the Manhattan Project. The first attempts at supercomputing were made by organized teams of operators with arrays of mechanical desk-top calculators. In 1945, Los Alamos researchers running their problem were the first users of the University of Pennsylvania ENIAC, the world's first large-scale electronic computer.

Shortly thereafter, Los Alamos implemented the John von Neumann "stored program" architecture into its MANIAC computer, with which it ran the first large-scale hydrodynamic calculations for the thermonuclear bomb.

IBM produced its first von Neumann machine with capabilities similar to the MANIAC, the IBM model 701, in 1953. Serial number one was installed at Los Alamos. This began the era of Los Alamos/computer vendor collaboration that still holds today.

The IBM connection lasted into the mid-sixties, at which time Los Alamos began to work closely with Control Data Corporation whose machines, designed by Seymour Cray, became the fastest. In time, Los Alamos had four of Control Data's first supercomputers.

Start-up company Cray Research, Inc., announced its first Cray-1 supercomputer in 1975. First Cray-1 was installed at Los Alamos for testing and evaluation in 1976. The close collaboration between Cray, the entrepreneurial supplier, and Los Alamos, the sophisticated and demanding user, was key to the success of Cray supercomputers.

Since then, a succession of increasingly capable Cray supercomputers has provided the computational power the Laboratory has continued to need in ever greater quantity. The Cray-1 was followed by the Cray X-MPs and, most recently, by two new Cray Y-MPs. The Cray Y-MP represents a twenty- to thirty-fold performance improvement over the Cray-1.

Today, in addition to our continued collaboration with Cray Research, Los Alamos is once again working closely with IBM in its quest to develop what may be the next-generation supercomputer.

Because we envision the computing environment of the future to consist of many different computer resources available over widely distributed areas interconnected via very high-speed networks, we are also working with Digital Equipment Corp., Sun Microsystems, NEXT Apple, and others.

However, it is clear that dramatic improvements in supercomputing will have to come from massively parallel processing—where hundreds or thousands of processors cooperate to solve a single problem. The challenge is to design efficient hardware and software to achieve this potential.

To meet this and other computing challenges, Los Alamos has established the Advanced Computing Laboratory to investigate parallel computing, high-speed networking, distributed computing, and visualization.

The central focus of this laboratory is the second-generation Connection Machine, the CM-2, built by Thinking Machines. It has 65,536 processors, 512 megabytes of memory, 4 frame buffers and monitors, and a 10-gigabyte data storage system. Let me add that the development of the Connection Machine was sponsored by DARPA.

Very high-speed networking (at a gigabyte and more) is also being pursued in our Advanced Computing Laboratory. We are leading an effort with Thinking Machines to develop a high-speed channel that will interconnect several large elements of our existing computer network, including the Cray machines with the CM-2.

The Advanced Computing Laboratory at Los Alamos is also teamed with Rice University, Cal Tech, and Argonne National Laboratory in the National Science Foundation's (NSF's) Science and Technology Center, which focuses on parallel computing.

I have walked you through this history of supercomputing at Los Alamos to make the point that to stay ahead in a technology as critical as supercomputing, it takes an incredible dedication often measured in decades, not one- or even three-year funding cycles.

I encourage Congress to support the National High Performance Computing Initiative. Federal agencies, such as DoD/DARPA, DOE, NSF, NASA, and National Security Agency, all must play a role. The DOE and its laboratories must be major contributors. They provide the market pull of a sophisticated user, a record of close working relationships with computer vendors, a potential for multiple payoffs to the defense and civilian sector, an ability to further state-of-the-art hardware and software technology, and a hand in training the human resources of the future through their interactions with students.

Superconductivity

Since the discovery of high-temperature ceramic superconductors, we have all been made aware of the promise of these materials to revolutionize the commercial and military worlds.

The past two years, however, have demonstrated that it will be a long, hard road to commercialization. The recent report of the Committee to Advise the President on High Temperature Superconductivity (the so-called Wise Men's report) stated that major commercial exploitation is one or two decades away. Efforts aimed at practical applications must be sustained over that same period to attain practical results. The Committee was concerned that much of U.S. industrial activity is unlikely to survive what it believed would be a long-distance race.

The Wise Men specifically recommended (1) strengthening the scientific base with additional investments in superconductivity research at universities and (2) creating Superconductivity Consortia comprising research universities, government laboratories, and private industry to carry out a jointly agreed-upon scientific and technical plan aimed at advancing superconductivity and its applications.

The DOE laboratories are ideally suited to participate in such consortia or otherwise contribute to long-range research and technology development. Several of the laboratories have been active in superconductivity research for over three decades and most have excellent capabilities in materials science and technology, which will be required to make progress toward commercialization.

At Los Alamos, for example, we have one of the leading superconductivity research groups in the world. In the four years preceding the discovery of high-temperature superconductivity when world interest in superconductivity was quite low, we published over 150 papers on superconductivity. We have also been intimately involved in applications including building and operating a superconducting magnetic energy storage system for the Bonneville Power Authority, a prototype direct-current superconducting power transmission line, and novel magnetic refrigeration concepts.

In 1988, the Department of Energy at our urging established Superconductivity Pilot Centers at three of its laboratories—Los Alamos, Argonne, and Oak Ridge national laboratories. The objective of the Pilot Centers is to work closely with private industry to develop technologies that will lead to rapid commercialization of high-temperature superconductors. The Pilot Centers will focus on long-term, generic, precommercial technologies.

A side objective is to develop a better and more timely mechanism for DOE laboratories to work with private industry on government-funded and jointly-funded initiatives.

The Pilot Centers have drawn enormous interest from private industry. Several cooperative agreements have been signed and several more are being negotiated. At this point, the Pilot Centers are struggling to obtain sufficient funding to take advantage of the great interest in the private sector.

At Los Alamos, some of our superconductivity work is also supported by the Department of Defense, principally the Strategic Defense Initiative Organization and DARPA. We want to develop a greater synergism between the civilian and defense-related superconductivity work.

I believe that the DOE laboratories could contribute significantly more to DoD superconductivity research and development. In fact, the DOE model of Superconductivity Pilot Centers could be extended to cover defense applications by working with both universities and defense contractors. Such Centers could serve the role of consortia aimed at technology development for both military and civilian applications.

Materials Synthesis and Processing

I want to mention a third major technology that crosscuts many of the 22 critical technologies—materials synthesis and processing. Research in materials science and engineering over the past few decades has led to a greatly improved understanding of the properties of materials and the relationship of these properties to their microstructure (such as crystal structure and crystal defects). In addition, many new methods of synthesizing novel materials, such as vapor deposition or rapid solidification processing, are coming of age.

Today, we stand on the threshold of atomically engineered materials with tailor-made properties for specific applications. In my opinion, a determined effort at creating a more scientific basis for the synthesis and processing of engineering materials is required to get us over the threshold.

In the United States, we have available computers that permit sophisticated modeling of process variables to design more intelligent processing systems. We have witnessed a revolution in laser-based and other diagnostics that should permit *in situ* measurement and control of process variables. We now also have an impressive array of materials characterization facilities that permit us to assess the microstructures and properties of the materials we produce. And we are beginning to develop a better appreciation for the importance of chemistry in ~~synthesis and processing~~.

What we need to do now is to put it all together to develop a more scientific approach to the synthesis and processing of materials. I want to stress that this approach includes structural materials, such as composites for airplane skins where mechanical properties are most important, and electronic materials such as gallium-arsenide chips where electronic, electrical, optical, or magnetic properties are most important.

Currently, many governmental agencies have programs in materials synthesis and processing specific to classes of materials of interest. The DoD, and especially DARPA and the Air Force, has been aggressively sponsoring materials processing and manufacturing technologies. The DOE, NASA, the Army, and the Navy have also supported such efforts.

I would like to see the United States establish a network of eight to twelve materials synthesis and processing centers that can also bring together capabilities in computer modeling, diagnostics, and characterization. Such centers would elevate our nation's scientific basis for the manufacture of advanced materials.

This initiative would be similar to the DOE national user facilities (principally aimed at materials characterization) established over the past few decades. These facilities have made an enormous impact on the scientific understanding of materials.

I believe that the materials synthesis and processing centers should be physically located at the DOE laboratories and the universities that have demonstrated an expertise in materials synthesis and processing and that also possess the necessary people and facilities to contribute in computer modeling, diagnostics, and characterization.

Many of the DOE laboratories meet these criteria. They not only have the computational resources and laser expertise, but they also house the sophisticated user facilities featuring synchroton light sources, neutron scattering facilities, and high-resolution electron microscopes. This would allow them to carefully characterize what they synthesize and process. The DOE laboratories should be closely linked with universities to ensure a scientific approach to materials synthesis and processing and the training of students.

These centers should also feature a close collaboration with private industry to effect a rapid transition from scientific synthesis and processing into applications. I envision industrial partnerships similar to those being developed in our Superconductivity Pilot Centers.

For the purpose of critical defense technologies, such an initiative could be sponsored by the DoD, perhaps by developing advocacy for this concept at DARPA. It is my belief, however, that most of the technologies would have an impact on both civilian and defense applications. Therefore, sponsorship by multiple government agencies, such as the DOE, the Department of Commerce, and NASA should be considered.

Summary

In summary, I have concentrated on a few technologies that are so critical and that crosscut many of the 22 technologies described today that they require decades of dedication and support.

This is where the DOE laboratories with their long history of scientific excellence and their dual civilian and defense roles could make special contributions to assuring the health of our defense technology base.

I have discussed three of these cross-cutting technologies.

Supercomputing - where Los Alamos and Lawrence Livermore national laboratories have contributed immensely for over four decades. And we stand prepared to continue that role in the face of stiff international competition for the U.S. lead in supercomputing.

Superconductivity - where we have recently developed new partnerships with private industry with the Superconductivity Pilot Centers—a concept that I believe should be extended to defense applications.

Materials Synthesis and Processing - where I propose a new role for the DOE laboratories in developing a more scientific basis for materials synthesis and processing to ensure a steady flow of advanced, high-performance materials into both military and civilian applications.

Senator **Bingaman**. Thank you very much.

We are going to use the 6-minute rule here. Let me ask 6 minutes worth of questions, and I will defer to Senator Glenn, and he can do the same. We will come back again if we have more questions.

FUNDING LEVELS

I guess my general question which first I will address to Craig Fields is the questions of how we can assure an appropriate level of funding for the research that goes on in these critical technologies and assure that what is happening in one area of the Government is coordinated and in some way integrated with what is happening in other areas of the Government in the funding of the research.

For example, let me just throw out gallium-arsenide. The preparation of gallium-arsenide and other compound semiconductors is the second of these technologies that are listed in this DOD report. I am well aware that that is a major part of the ability to pursue this supercomputing preeminence that we would like to maintain.

What are your thoughts about how we in Congress can ensure adequate funding in the research effort that goes on in that area?

Dr. **Fields**. If you take a calculator, as I did, and go through the report, you find that about 20 percent of the S&T budget is allocated to those 22 critical technologies and 80 percent to other things, whatever they are.

You would think that those 22 critical technologies would be properly funded, fully funded, appropriately funded before spending on the subjects which are covered by the other 80 percent. In fact, there are some gaps. There are gaps in gallium-arsenide. There are gaps in X-ray lithography and some others. That is something that has to be done at the level of the USDA or the DDR&E. We have made these gaps known to them, and there is no issue of communication.

Again, I think that while you can raise in legislation issues of those gaps and issues of fully funding the high priority items at the expense of what are explicitly lower priority items, if the critical technologies are higher priority items, that is something which I think that really has to be handled within the Department and cannot easily be handled by the Hill.

I wish there was some magic formula I can give you, but I do not think there is one. Again, it has to be done on an item-by-item basis.

With regard to your second question, which is actually much more difficult to deal with, I want to carefully distinguish between coordination and integration because you use those words as if you meant about the same thing, and it is really quite different in my mind.

I think there are perfectly good mechanisms at work today in the executive branch for coordinating investment among the different departments if by coordination you mean communication so that everyone knows what everyone else is doing and there is not inadvertent overlap or inadvertent gaps.

The Federal Coordinating Council on Science, Engineering and Technology with all of its working groups and subcommittees is an effective form for that communication, but that is not the point.

The point is that by integration I would mean that there be some investment strategy which might not be absolutely optimal for each department but would be optimal for the Federal Government as a whole.

That is the thing that is lacking, and what is a necessary condition for having that is governmentwide leadership in science and technology investment. I do not have a very crisp and clean model of the functions of the President's science and technology advisor, but it would seem that that could be something that he would do and would be something that he perhaps should do. We will have to see how that works out.

Senator BINGAMAN. Do either of the other witnesses want to comment on this general question of how we ensure adequate funding or try to integrate the effort that goes on as far as support for research from the Federal Government?

Dr. SHAW. Very quickly, I would echo a fair amount of what Dr. Fields said. Congress cannot do it itself. Planning and supporting technology is a very complex process, as you well know.

I think there are three steps that Congress needs to ensure. The first is that it needs to get from the Defense Department a rational plan as to how DOD proposes to go about doing this; second, assure itself through mechanisms such as hearings and others that, in fact, the plan is reasonable and supportable; and finally, appropriate the money for the plan.

Probably most importantly, Congress should keep a reasonably constant level of support to avoid drastic yearly fluctuations that from everything we have seen tends to undermine rational R&D activities.

Dr. HECKER. My comment would be that as one looks at the basic research in the United States, the pluralistic approach that we have to funding basic research has worked extremely well, and I would like us not to overly constrain that process.

As we get closer to technology development, however, then clearly the integration that Dr. Fields talked about is absolutely necessary, and I think in the Defense R&D, for instance, we run into that at all times with DOE/DOD coordination of what we do with our laboratories. I think a better coordination would be very helpful.

Again, about the only place that I could point to where it might happen is through the President's science advisor.

CRITICAL TECHNOLOGIES

Senator BINGAMAN. The obvious question that comes to mind when you start focusing on these critical technologies is the industries that necessarily will depend upon these and that will grow out of these technologies. High definition television is one example of an industry which rests at least in part on some of these critical technologies. To an extent, I guess, supercomputing is an industry that rests on these new materials, ceramics, that again is an industry that rests upon a strong research effort in the area of new synthesizing of materials.

What is the appropriate action that Congress can take regarding some of these critical technologies and assure that we do not fund all the research and someone else develops the products?

Craig, that is an easy one. You have another minute here before Senator Glenn's turn, so go ahead.

Mr. FIELDS. I am deeply involved in the high definition display issue at the moment, and so I can tell you what I see is the largest impediment there. Technology there is not the impediment. U.S. firms have plenty of great technology, better than I know anywhere else, although they certainly need a little support more than matched by their own investment in the future to get that technology up to the point of manufacturing.

The problem is capital costs for investment in the manufacturing facilities. Even though it is not DARPA's business to do it, we did a calculation of what capital investments would be needed by U.S. manufacturers in chip production facilities, in display production facilities, VCR facilities and in DBS antenna facilities. Those are the four drivers here. Just how much money would you have to spend to have the factories to get the market share? You may not get it anyway if there is unfair competition, but you have to have the factories. It is many, many billions of dollars.

Unless capital costs are reduced, companies are not going to be able to invest that money.

What the AEA proposed in their plan, which I am certainly looking at now, as is Secretary Mosbacher and Secretary Cheney, is that the Congress might provide either loan guarantees or low interest loans to deal with that much harder problem, not the technology part but the manufacturing part. Whether that is the right approach or not I think is a little too early to say, but that is one thing to keep in mind.

Senator BINGAMAN. My 6 minutes are up.

Senator Glenn.

Senator GLENN. Let me comment on that. I had legislation in last year for ACTA, we called it, Advanced Civilian Technology Agency, which would be a civilian counterpart to DARPA. It was not passed, but I thought that we could have ACTA as a central focal point for what the major research and developments are and provide an interface to keep industry and people involved and to make them aware early on so that we do not just wind up doing the research in this country and the development and manufacturing in Japan, which has happened too often in the past.

We did not get that through, but we will probably reintroduce the legislation again this year.

I want to make several comments here, and I am already late for another meeting so I am going to have to go. There will not be too many questions. I just wanted to comment on some of your activities here.

NEED OF CONSTANT SUPPORT

Dr. Shaw mentioned the need for constant support. Nothing is more important than that. I would rather have a small budget in research and have it constant than I would have a budget that fluctuates up and down. All you do is throw money away on that. So I think that is so, so important.

As far as our organization goes, I know you gentlemen have some differing opinions about this because I have talked to you very recently about this. I feel that if you want to be there when the pie is getting cut up, you better have a department of science and technology one of these days like most other major industrialized nations of the world have.

We have developed a good scientific base in this country by our rather ad hoc approach to it and what has developed in cooperation as opposed to integration, as Dr. Fields points out. I think for the long term, however, we are in the competition now in research, and we had better organize to get along with it.

I know all the opposition that comes from the scientific community because everybody has their own little pipeline that they have developed through the years, and they do not want to see it disturbed. That is the only reason that has ever been given to me for why we could not have a better set-up and better organization with a department of science and technology that sits there at the table when the pie gets cut each year. I think it could be done better on a long-term basis for this kind of constant support if we did it on that kind of a basis.

Now I am under no illusions about the likelihood of getting a department of science and technology right at the moment, but I think it is something we certainly should consider for the long run.

Let me back up a little bit, too. I think this country became what it is because of two things: basic education for everyone. It was not just for kids in the castle. It was for everyone. Then this country poured more into basic research. We learned the new things first, and we put it to work. We had such a big lead over everybody else in the world, and now we do not have that pad as much anymore. The pad is shrinking, and so I think we have to put more effort into this and on a constant basis. I think Dr. Shaw's point on that is absolutely right.

I make it a point each year to make at least one trip to some of the national labs. Just a couple of weeks ago I visited Dr. Fields over at DARPA for a full day to get a rundown on all their programs. It was a fascinating day. Then I spent a day with Dr. Hecker out at Los Alamos and at Sandia, and I usually try to get to Lawrence Livermore once a year and Cal Tech and Stanford on some of the computer research that they are doing and so on.

The advances we are making and potential civilian spinoff is difficult to quantify and say one is military and one is not. Through the years we have had such tremendous advances that have come out of the military and worked their way into the civilian uses.

So DARPA and all your facilities I look at as national resources. I wish we could just engender excitement around here. Jeff is a rare lawyer here. He understands and knows and is interested in all these things, but the Senate is made up of two-thirds lawyers in the average. If they have not been particularly into the science field, why it does not get quite the same importance as other things, with all due respect to my legal brothers in the Senate.

I just wish we could have them go out to these labs and get excited about some of these projects. We thought it was a big deal when we talked about megaflops and megaops and gigaflops and now we are talking tera, a trillion operations per second. That is hard to envision for anybody.

What is the next one beyond that you told me?

Dr. FIELDS. Petahops.

Senator GLENN. All right, I will take your word for it.

Anyway, we are up to that kind of capability in keeping up with what is going on in the rest of the world. It is just amazing what is coming out of these labs, and I wish we had an almost unlimited budget for what you people are doing. We are talking about that kind of operations per second, and we are talking about for some of the military uses taking the output of a Cray-1 computer, which is 6 feet high and about 6 feet across, I guess, roughly, and taking that down to very small sizes. I do not know whether the sizes are classified.

Is that classified?

Dr. FIELDS. The size of a soup can.

Senator GLENN. Another one was the size of a cigarette package. Anyway, we are down to little things like this. The Cray computer was an amazing concentration of power when it was built, and that is the kind of operations we are doing now at some of these labs.

So I just wish we could get broader support for all of them here. This is obviously not a question. It is more of a statement than anything else. I just wanted to stop by this morning because I recently had the opportunity to visit with each of you for a day at your labs. It is exciting.

At Los Alamos, you have broadened out beyond your specific nuclear mission that was almost your sole reason for existence back in earlier years. You are into many different areas now, and that is a national resource out there.

So I just wanted to stop by and make sure that I had a chance to express my appreciation for what you are doing for the country. It is not just in the military field. It goes over into the civilian field, and we need more of it. If we are going to be competitive into the future, as I said in our Democratic caucus a couple of weeks ago. We were talking about the FS-X, an issue that we are going to have on the floor later today. It is over on the floor right now, I guess. We are going to have to vote on that.

My words basically were do not complain 10 years down the road. Whatever we vote on FS-X right now, we are beginning to be concerned more and more about what the Japanese are going to do with all this technology. Do not come back 10 years from now and complain about what the Japanese do if we are not willing to go ahead and get into research right now and outresearch and outcompete. That is the basic message that you people have, I think. We can outcompete anybody else on the face of this earth if we just do it, but we are not going to do it if we cut back on funds and cut back on your operations out there and then complain about somebody getting ahead of us in research.

So that is a statement, not a question, but I just wanted to stop by.

Jeff, I used more than my 6 minutes. Sorry. I have to go.

Senator **Bingaman**. We appreciate your being here very much and your leadership on this full range of issues.

I would just ask another question or two before we go to the second panel. The question of how we organize ourselves to pursue some of these things I think is fairly important, and we have a lot of different models. We have certain ways we organize ourselves to pursue the research, and I think, Dr. Hecker, you have described the group that is working on superconductivity and their proposed way of pursuing that. Perhaps that is another way, a slightly different way we can organize ourselves to pursue research on new materials.

SUPERCOMPUTING

Do we need to also structure something in the area of supercomputing, not perhaps to accomplish the research but to ensure that we maintain a lead in that critical industry? Does that make sense?

We got the report in the paper this morning about Cray splitting in two. Is this an area that Government could best leave alone? Dr. Fields.

Dr. **Fields**. Over the last year, year and a half, a cross-department Government team has been working on this program, this definition in high performance computing that Dr. Hecker mentioned.

It has really worked quite well. This is one of the few cases I have seen where after a lot of talking back and forth there is a real plan and then an implementation plan, agreement of the different roles of the different departments, agreement about a management structure, agreement about the importance of doing it and recognition that it is not only important to do the research but also to commercialize it and get it out into real products so that it can be bought both in the civilian sector and in the defense sector.

The issue is whether anyone is now going to execute that plan. That is something that is currently under discussion between the President's science advisor, the current one, and OMB and in discussion within the executive branch.

I do not know whether it is going to be part of a future administration request, and I do not know what it would be if it were part of the request. This is one case where there is a plan where at the technical and working level in the Government, the executive is in agreement on what to do and what should be done.

Senator **Bingaman**. Is this out of the Office of Science and Technology policy?

Dr. **Fields**. Yes, that is exactly right.

Senator **Bingaman**. Does the plan have in it elements that Congress needs to address in its funding of DOD this year?

Dr. **Fields**. It depends on how long we want to delay starting it. It is not part of any department's request for fiscal year 1990, I believe, simply because it just did not make it in, not for any reasons of principle. Is that fair?

Senator **Bingaman**. It starts in 1991.

Dr. **Fields**. It starts in 1991. It certainly could start a year earlier, but it is not in any formal request.

Just for completeness, let me mention that in addition to that plan, in DARPA we have gotten sufficiently alarmed over the situation that we intend to do something and in particular to work, which you will see announcements later, with the Cray Company to try to strengthen their position and also to work with some of our other parallel computer manufacturers to urge them more in the area, to do more in the area of scientific computation, which is the kind of work that we talked about.

So in the next few weeks you will see some announcements of what we are doing as an intermediate step until that plan can actually get started.

Senator BINGAMAN. Dr. Hecker, did you want to comment on that?

Dr. HECKER. Yes. I agree with the comments as far as the Government's involvement. It is pretty clear in the workings of this committee over the past year and a half that a number of governmental organizations need to stay heavily involved, and I think the overall game plan is a very good one.

The one comment that I would like to make somewhat closer to home is that at Los Alamos we have not only kept up but we have intensified our efforts of working with the computer vendors. Whereas we used to typically work with one supercomputer vendor at a time, we now have very close relationships with Cray, very close relationships with IBM, and we are also now working with thinking machines, with DEC, with NEXT, with Apple, because the problem has become a much broader problem in supercomputing.

So it is our philosophy that we need to work with the industrial sector very, very closely, because what we are able to bring to the table is this business of being a sophisticated and very demanding user.

Regarding your question earlier as to how we can protect ourselves against the competition from the Japanese on the hardware, that is a very difficult problem that Dr. Fields tried to address and I think we are going to have great difficulty.

On the end that we have worked in supercomputing is to say that we know how to use supercomputers to solve large, complex problems, so we know how to do the parallel processing. So our interaction with the computer vendors will keep, in my opinion, the United States ahead on the software and the use of the supercomputers, but we will have a tough time on the hardware, although even on the hardware there we are working with some of the companies to give them a window on the world in superconductivity, for instance, as to how that might be applied in the future for supercomputers.

So close to home we are working very closely with the private sector to make certain that they stay as competitive as possible.

Senator BINGAMAN. In the area of new materials, again we have a research need which is being met to a large extent, and DARPA is doing a lot of that. You indicated the Air Force, I believe, is doing a significant amount?

Dr. HECKER. That is right.

MATERIAL SYNTHESIS AND PROCESSING CENTERS

Senator **Bingaman**. You suggested that we have material synthesis and processing centers. Would it be your thought that those centers would just perform research or that they would involve industry and be a lead-in to the maintenance of a new materials industry? I recently read an article about the new materials industry developing in Japan and where we have a greater effort going perhaps in research. They are certainly putting a tremendous emphasis on development of small firms that are active in that area.

Let me ask you and then Dr. Fields or Dr. Shaw.

Dr. **Hecker**. The emphasis that I wanted to bring to the materials processing and synthesis is a scientific emphasis, the scientific basis for synthesis and processing of materials, and so that needs the research community's involvement.

The centers that I mentioned would definitely have to be linked with industry in order to be able to transition that knowledge out to industry where it is going to do some good as far as actually developing these new advanced materials. That is one of the things we have been trying to do at Los Alamos in the areas like superconductivity to find a new way to interface with industry more effectively so that we can take the research ideas and get them out into applications so that the centers would have a strong research focus, because I think it is the scientific basis that will lead to much greater utilization of advanced materials. However, they have to be closely linked with industry.

Senator **Bingaman**. Do either of you have comments on that?

Dr. **Shaw**. Let me comment on the problem right here. To have healthy, useful high technology industries, you have to do both the research and the productization; that is, you have to translate the products of research into a viable industry. A nation's industries can survive on the basis of using the research that other nations do or other industries do and translate them into products and have a very healthy industry, but you cannot do it the other way around. You cannot just do the research and have somebody else make the products.

We have been in that situation in many cases, and it is one which leads to real problems.

Several months ago I was at a meeting with some Japanese corporate R&D managers, and one of them floated the following idea. He said, well, we should really be cooperating in research and industry. We should cooperate on the basis of what each of us does best. You Americans do research best, and we are best at making products, so let us cooperate on that basis.

I am sure they would have been very happy with that situation, but it is not one which ultimately is going to lead to U.S. industries being useful and viable in these vital high technology areas. I think we are beginning to feel our way toward what the real answer to this problem is, that somehow we need to take recognition of and support the industries themselves and not just do the research in our own Government facilities.

Senator **Bingaman**. Craig, do you have a comment on this?

Dr. **Fields**. Yes, I do.

The notion of having materials research and technology centers is a good one. There are other plans equally good for optoelectronics consortia, for ceramics consortia. We are currently funding three superconductor consortia that are industry based with joint funding from the industry, actually much more from their side than ours.

All of these are good and important things to do. There are problems, however, of theology and of organization. We already talked about organization. When I am visited by officials from MITI and they say DARPA is like MITI, I tell them no, it is not, because in MITI you have DARPA and the Department of Commerce and the Department of State in part and Treasury in part and USTR in part and Export-Import Bank in part and so on. So you are in a somewhat better position than DARPA to do the things that you might want to do.

We have already talked about organization, but I want to say a few words about what I will call theology. A fundamental impediment to getting a lot of these good plans to happen besides the prior fundamental I mentioned, personnel, is whether you want to or not. When I say "you", I do not mean you personally but whether the President and whether the policy council and whether the Secretary of State and so on and so forth actually support these things.

On my side of the river we are working hard to have good defense policy, but on the other side we are told do not have industrial policy. On my side of the river we work hard to have priorities, and on the other side people are told not to pick winners and losers. It goes on and on like this.

I am not saying what is right or wrong, but this is a very fundamental policy issue that you are getting into, and we want to try to sustain some critical industries. I am not saying the answer is yes or no, but that has not been faced. The de facto answer has been no, and that is what is impeding doing some of these very good ideas that people are coming up with.

Senator BINGAMAN. All right. I agree with what all of you just said.

Let me just stop with that and thank this panel very much. We will try to follow up with some of the excellent suggestions you made in your testimony and see if we will be in a position to do some good when we mark up our bill later this year.

Thank you very much. Our second panel is composed of Hon. Al Sikes, who is the Assistant Secretary of Commerce for Communications and Information, and Professor Lewis Branscomb from the John F. Kennedy School of Government. If they would come up to the witness table.

I do not know any particular order to go forward in. Why not start with Dr. Branscomb.

Dr. Branscomb is the Albert Pratt Public Service Professor at the John F. Kennedy School of Government. He recently testified before Senator Kennedy's Labor and Human Resources Committee on Technology and Industrial Based Issues, and he is leading a study group at Harvard looking at new use technology issues. We very much look forward to your testimony and appreciate your coming to town today to give it.

STATEMENT OF DR. LEWIS BRANSCOMB, ALBERT PRATT PUBLIC SERVICE PROFESSOR, JOHN F. KENNEDY SCHOOL OF GOVERNMENT, HARVARD UNIVERSITY

Dr. **Branscomb**. Thank you very much, Senator.

I spent 15 years as chief scientist at the IBM Corporation, and I spent 20 years before that in the Department of Commerce, so I am delighted to share the table with what would have been a former colleague. I was also for a while the Director of the National Bureau of Standards, and I have also served on the Defense Science Board and have been chairman of the National Science Board. So I have looked at this dual use issue from more than one side, and I commend this committee for the leadership that it has taken in addressing the question.

I think fundamentally, Americans have to ask themselves how, with limited resources and much stronger competition overseas, do we manage to sustain a very strong defense capability appropriate to our place in world affairs and at the same time compete with an increasingly effective group of friendly industrial democracies in order to sustain the economic well being of our people.

In both the defense side and on the commercial side, we are facing real difficulties in our innovation system, our innovation process. We are not satisfied with the speed or the economy with which we reduce our scientific knowledge to practice in either of the two areas.

There is also a lot of interest in the relationship between these two areas, the question of how much synergy might be found between defense and civil technologies.

In the past people usually thought of that issue as a question of spin-off from the Government's investments in defense technology to the civil side. Today we appreciate that spin-on or the reverse process from the commercial sector to national security may be more important than spin-off.

So it is appropriate to ask where are the most favorable opportunities for sharing for both defense and civil applications, of significant elements of the Nation's science and technology system. What public policies might provide the right balance between a shared industrial technology base serving both defense and civil needs and the continued specialization by single purpose institutions for each sector separately?

I am under no illusions that the right answer is either an all-shared technology base or two entirely unique and separated defense and civil establishments. The quest of our study is to understand that issue of balance.

Indeed, there is no a priori evidence that enhancing synergy between defense and civil technology will solve the problems of excessive cost, poor quality or extended delays until successful market entry or IOC.

It may be true, however, that searching for synergy will teach us something about the technology system we have, from which we can learn a lot about remedying the shortfalls and the innovation process in both sectors.

The starting point for this analysis, I think, is to understand how dramatically circumstances have changed both domestically and internationally since the 1950s and 1960s. In 1960 the Federal Government invested $8.74 billion in R&D, while the private industry invested only $4.5 billion. Of the Federal portion in 1960, 80 percent was defense.

Thus, for the first 15 years after World War II the Defense Department was the dominant source of sophisticated technology in the United States and, indeed, for most of the rest of the world. High technology industry was just beginning to be a major force in the world economy.

Today things have really changed. Even though there has been a doubling of defense-sponsored RDT&E expenditures during the Reagan years, private firms now outspend the military on R&D by 50 percent and, indeed, in the aggregate match the total Government's R&D investment. Defense-related R&D no longer dominates the national effort at home, and abroad our two most effective industrial competitors, Japan and West Germany, outspend U.S. civilian R&D as a percentage of the gross national product while they devote much smaller resources to military purposes.

Nevertheless, as Congress debates the Federal Government's responsibilities for enhancing both economic competitiveness and military security, it is tempting to look to defense technology agencies for initiatives aimed at the industrial technology base. Congress is still quite ambivalent about giving civilian agencies such as Commerce such a role. I suspect Commerce is even a little ambivalent about accepting it. The budget crisis makes defense all the more attractive as a surrogate for a national technology policy. That is what I refer to as the "Willie Sutton theory" of technology policy.

The Defense Department has responded to congressional and its own concerns about the loss of competitiveness in the commercial technology base by investing, for example, in SEMATECH and in high definition displays and in quite a number of other areas we have already heard about this morning.

I do believe it would be a mistake to expect the Defense Department to carry out a surrogate industrial policy for the country without our first carefully limiting the role of the Defense Department and our expectations for what defense can be expected to do on its own.

First of all, the Defense Department's relations with industry have become even more adversarial than they were in the past and, indeed, more adversarial than our other relations between civil agencies and industry.

The undoubted capacity of many defense agencies for managing high tech R&D often leads them to micromanage, and that relationship does not well suit the kind of partnership that we need for joint developments of industrial technology with government interest.

As the report of the American Electronics Association on HDTV illustrates, a successful public/private partnership to recapture a lost industry or sustain threatened ones must address many issues other than R&D. In fact, most of the problems are other than R&D, as indeed Dr. Fields said earlier.

Finally, until the Defense Department can get its own acquisition house in order, including a radical improvement in its ability to inject incremental improvements in technology in its systems and deploy them in a timely manner, defense is hardly in a position to teach commercial industry how to meet international competitive pressures.

I strongly commend to this committee the study just completed by MIT that looks at the nature of what our industry has to do to be more competitive, because I believe they have it right.

On the other hand, their strategies that could enhance the defense community's ability to——

Senator **Bingaman**. Is that the Made in American study?

Dr. **Branscomb**. Yes, sir. It includes, by the way, both in that book and in supplements detailed analyses of the technological state of a number of our industries. The ones I have read are very good.

I think there are strategies that could enhance the defense community's ability to defend the Nation more economically while also providing positive stimulation to high tech commercial industry. These strategies will clearly be most useful in the so-called dual-use industries, those whose products find application both in defense and commercial trade. I think they are worth pushing even without necessarily concluding a priori how much of our defense business those policies will assist with or how much of the industry's competitiveness problem they might help address.

Traditionally, we tend to think of defense industry as composed of specialized companies dealing in weapons technologies that have few commercial counterparts. Now we talk a lot about dual-use industry. Why has this dual-use industry notion become so important?

First, it is important to appreciate that every year national security depends more on capabilities that are quite familiar requirements in the civil economy. We spend more and more in defense on systems for acquiring and analyzing information for logistics management, for rapid deployment, for maintenance and repair, communications command and control. So there is a merging of functions.

Second, in many areas of high defense priority commercial industry is advancing the rate of introduction of technology faster than the military. In those circumstances the technology is better positioned to diffuse from the civil side to defense as a spin-on rather than the other way around.

Third, this has happened in part because high tech commercial industry has outgrown defense industry in the last 25 years. Since 1960, privately funded commercial R&D has grown in current dollars by a factor of 12.78, while U.S. military R&D has grown only by a factor of 5.11.

Thus, in the U.S. civil industrial R&D grew two and a half times as military R&D, and in Japan and Germany nonmilitary R&D has grown in the same period to a higher fraction of GNP than in the United States by a factor of one and a half. In spite of all of that, we still see that private industry underinvests in advanced technology.

So the snapsot I want to leave you with is that private industry is underinvesting, having a tough time competing. At the same time, our defense technology is no longer the dominant force in

American technology generation, and defense policies have to be based on that reality.

Indeed, to impress upon you this fact that our defense industry is part of our commercial scene, let me just give you three interesting facts.

First, the biggest defense prime contractor in 1987 ranking number 35 in the Forbes sales 500.

Second, among the top 100 defense prime contractors, the defense work of the 10 largest companies amounted to only 2.6 percent of their sales.

Third, the prime contracts of the 78 largest contractors averaged only 9.9 percent of their total sales. Only 12 had less than 50 percent commercial revenue, only four less than 25 percent.

In 1987, these 100 prime contractors did $90 billion in military work for the Government out of a total procurement of $142 billion, but they did $90 billion of total commercial sales, nearly a quarter of the GNP. One might imagine that their research labs, their technology and product development organizations and their manufacturing technology would synergistically support both the trillion dollar commercial market and the needs of national security, but when we look at the relationship between these big manufacturing companies and the Defense Department, we find it seriously strained.

In fact, many of these companies keep their defense business at arms length from their commercial business, and they do it for a lot of reasons other than the purely administrative and legal ones that Dr. Fields mentioned earlier today.

In fact, the whole technology cultures of our defense industry and our commercial industry are different, even though those defense companies are embedded in commercial companies. Let me give you a few examples.

In the commercial side, the innovation process is opportunistic. It undertakes high risk introduction of new products based on new technology. On the military side, innovation is constrained by the requirements set by the Government.

On the commercial side, competitive companies respond quickly to new market conditions and keep reinjecting technology all the time. On the defense side, we have decade-long programs, very high costs and difficulties for changing the technology.

On the commercial side, we put a premium on low cost manufacturing of high quality and high reliability. On the military side we put a premium on unique function and long shelf life.

On the commercial side we put a premium on process technology to increase the productivity for high volume rates of production. On the military side, we put a premium on R&D to improve capability in low production rate, low volume manufacturing environments.

On the commercial side, R&D and production and field engineering are tightly integrated and interactive. On the military side, we even contract separately for R&D. We guarantee contractually that the old and outmoded linear theory of innovation will be the method of making progress.

Finally, on the commercial side successful companies base their success on a proprietary technological advantage, and on the military side those same companies may be asked to share with a second source that very advantage if they work for the Government.

So I think under these circumstances, big shifts by industry are going to be necessary in how they manage the technology to be competitive and on the Government side changes in technology acquisition if we are going to make this dual-use idea work.

In my prepared testimony I have made six suggestions, and without dwelling on the detail I would like to just touch on them quickly.

THE TECHNOLOGY BASE

First, we need to restore investments in the 6.1 and 6.2 categories of the Defense budget to something much more like their 1980 proportionate level to the rest of defense RDT&E. Now you are familiar with those numbers. RDT&E in the last 8 years doubled in real dollars; operational systems development, 6.6, trebled; manufacturing prototypes grew by a factor of 2.5; and proof of principle prototyping, 6.3B, grew by a full 586 percent. I appreciate a lot of that is SDI, but if you subtract SDI, 6.3B grew by 202 percent.

Meanwhile, fundamental research grew 16 percent—that is, 2 percent per year in real dollars over 8 years—and exploratory development, the part that is really valuable to the private sector, shrank by 2 percent in the 7 years. That trend continues in the 1990 budget. Although in nondefense agencies basic research is being requested to grow by 4.5 percent, in defense it is requested to shrink by 6.4 percent.

In the applied research, which is more or less equivalent to 6.2, the Defense budget authority shrinks by 8 percent. Nondefense shrinks by 3 percent. Yet, development continues its trend of growth in both defense and nondefense sectors.

I think the urgency of addressing this issue is only greater when we appreciate that university research contributes importantly to 6.1 and even to 6.2 programs. The human resources that are required for defense industry are, to this extent, hostage to the lack of growth in this component of the Defense budget.

ENCOURAGING COMMERCIALIZATION

The second issue is we have to find a way to have the Defense Department encourage their contractors to commercialize their technologies for precisely the motives that Dr. Fields stated earlier; namely, to leverage the Defense Department's money with private sector initiative and investment and, indeed, with the press of private markets.

We have been told in our studies that in NASA when a company negotiates its IR&D indirect cost, they get extra credit from NASA if they have put in their presentation a demonstration that the company is going to find commercial uses of this Government-funded technology that is good for NASA, too.

We are told that in the Defense Department you can go to jail if you do that. That is a slight exaggeration, but the point is that all of us, the citizens and the Congress, are properly worried about improprieties in defense acquisition, but we have carried that concern to the point where if a company makes commercial use of defense funded, even indirectly funded technology, the suspicion may grow that somehow it has diverted Government funds to private purposes.

If we are serious about dual use technology, we ought to not think that way anymore. We have to think about public and private partnerships to build our industry, create jobs, create a competitive America and create a strong defense.

I do not know precisely how that is to be done, because we have not finished our studies in that area, but I think the IR&D program, as Dr. Fields said himself, is a very important component of our industrial base. It is substantially funded by the companies entirely by themselves. There is always a little confusion about whether the defense indirect cost allotted part of that is really Government funded or private funded, but never mind. It is important technology, and we should be trying to leverage it.

We also have a study under way of the SBIR program because that looks like a dual use program, too. All the agencies of Government that contract research out are told to be sure that a certain component of that goes to small firms. Congress is probably getting the last laugh on this program because the agencies, including NSF with which I have been associated, were dragged kicked and screaming into SBIR. The reports we get are that the program runs very well indeed, and the Government gets good value for its money.

We are given the impression that in NSF the agency works very hard to try to ensure that its SBIR grantees in fact find the commercial capital, do creative businesses, employ people and sell products. The Defense Department as far as we can see does good work with SBIR, but they are often satisfied when the research is done, are much less interested in commercialization, and certainly not putting pressure on to try to ensure commercialization.

MILITARY REQUIREMENTS

The third issue has to do with the military requirements process which needs to find a way to encourage a partnership between the military and the private sector to generate alternatives to the resolution of system requirements that allow the companies to leverage better their manufacturing and technology capabilities.

I appreciate that the requirement system is not as rigid as some people paint it; that the Defense Department spends a lot of time listening to companies presenting what they believe they can offer at least cost and greatest effectiveness, and there is a long interactive process in generating the requirements.

Nevertheless, we have heard an awful lot of people tell us that the system is too rigid, that there are circumstances in which if the system requirement could be modified, the vendors might be able to offer almost the whole solution for substantially less cost. That is an issue on which Jacques Ganzler is a great expert. His new book, "Affording Defense", which I think is excellent, makes this particular case very well indeed.

What it really speaks to is the desirability of restoring a partnership between Defense and its vendors and trying to reduce the armslength relationship which seems to be developing.

DIVERGENT STANDARDS

My fourth area has to do with standards, a subject I used to know a lot about on the commercial side, and concerns MILSPECS. MILSPECS had their origin in a time when commercial industry lagged military technology and often built to rather casual reliability and quality standards. That circumstance has changed quite a lot. Last summer we asked executives at NIST, the old NBS, when you go out and work with small manufacturing companies and you look at their reliability and quality standards, what customers drive those companies hardest on their quality and reliability? We were told that it is when their customers are commercial companies trying to compete in world trade that the requirements are toughest; that the military requirements tend to look a lot like most other industrial requirements.

To the extent that that is the case, we ought to have a real effort to get NIST and the Defense Department agencies together to try to find a way to make a real study of how to integrate our military and commercial standards processes.

I am sure on the commercial side, where everything is voluntary, there is also a need for a lot of enhancement of the process, but artificial differences in standards very often increase costs without giving any more function for our money. I think it helps explain why a number of companies do not even undertake custom business for the military, companies that have great capabilities in other respects.

OFF-THE-SHELF TECHNOLOGY

My fifth topic is civil off-the-shelf technology. This is a great idea, and it is one which the Defense Department itself is sponsoring under the acronym COTS. It is responsive to the notion that spin-on may be of greater technological value.

Let me give you one example of what I see as a possible approach to civil off-the-shelf technology which ought to be promising for the future. I will take my example not from my old employer, IBM, but from Digital Equipment Corporation and Raytheon Corporation.

In 1988 when Digital came out with a new model of their VAX processors, with new architecture, and new design, they had obviously made a deal sometime in advance with Raytheon Corporation to share with Raytheon the details of that design. So the day the civil-market VAX was announced, Raytheon announced the MILVAX.

By doing that, Raytheon was able to build a computer to military specifications, so it had all the required ruggedness and the like. In fact it had a somewhat different collection of hardware in it to meet military needs, but it was absolutely compatible with the VAX machine, and it only cost about 30 percent more for all that hardware. They are available on the same date. It should be possible, I would think, for the military if they use that computer to upgrade its technology incrementally as Digital upgrades its counterpart on the civil side.

It is important to realize that this did not emerge from a defense requirement, it emerged from a business plan by Raytheon Corporation of what it thought it could offer to defense that would help defense leverage all that commercial software.

SEPARATION OF MANUFACTURING FROM R&D

My sixth and last item has to do with the importance of manufacturability which, as the MIT study shows, is absolutely crucial to the competitiveness problem we have on the civil side where the real issues are cost and quality and responsiveness, not R&D.

I mentioned earlier that the Defense Department commonly contracts R&D separately from manufacturing. You will observe in the case of civil off-the-shelf technology that is not the case. Commercial industry funds all the R&D and integrates it with manufacturing.

Where the R&D is funded by the Government, it seems unfortunate to me that we have now put such a barrier between the completion of the R&D contract and initiation of production. What I worry about is the incentive for the R&D contractor to have his manufacturing engineers critically engaged in figuring out how the production is going to be accomplished. That is the thing commercial companies have learned they have to do. Many are still doing linear innovation, doing the R&D first in the corporate lab and throwing it over the wall to the factory, and the factory spends 5 years trying to learn how to make it. You cannot work that way anymore, and we should not make our defense program work that way.

That brings me to the end of my remarks. I think we really have to look at our total industrial capability from a unified point of view. We see structural changes on the commercial side where whole industries have been essentially abandoned. Then we look over on the military side and we discover that, for quite correct reasons of not wanting to be dependent on others for our weapons, we have sustained what is clearly a noncompetitive U.S. industry. We have to ask if that makes good sense on both sides.

An example would be shipyards. We long ago discovered we could not build commercial ships competitively with the Koreans, the Brazilians, and the Japanese, but we still build all our warships in our shipyards, as indeed we must because of the nature of the things being built.

I think we have a right to ask what evidence do we have that the technology in those shipyards is competitive if they cannot build competitive products? If we take that view right through our manufacturing, I think we will see great rewards to the country as a whole from trying to bring a more common technology base to support both military and economics objectives.

[The prepared statement of Dr. Branscomb follows:]

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Defense Technology Strategy: Leveraging and Supporting the Nation's Dual-Use Industrial Base *

Mr. Chairman, it is a pleasure to accept your invitation to testify today about how America can best sustain and deploy its scientific and technological capabilities to the achievement of both national security and economic competitiveness goals. This is the subject of a major study that my colleagues and I at Harvard University's John F. Kennedy School of Government are pursuing *. Its urgency arises from three broadly held concerns:

(1) The cost and complexity of defense systems acquisition are outstripping the Nation's ability to afford and manage them, and it is increasingly difficult to modernize and master the needed technologies. How can defense innovation be accelerated and cost-reduced? Where privately funded, civilian technology is very strong -and moving fast to keep up with competitors -how can the military be assured of access to private technology? Will industrial sectors suffering market share erosion from foreign competitors be strong enough to support the military's technology strategy? If not what is the defense department's responsibility to address matters of U.S. industrial policy?

(2) Commercial industry is increasingly beset by competition in international trade, and in many sectors is losing the technological advantage that sustained the economy's growth in the last 40 years. With the civil industry's eye on the foreign competitor, will industry still respond to defense needs for domestic capability? Should the government play a more activist role in sustaining the civilian technology base in industry? If so, what parts of this mission fall to civilian and to defense agencies?

(3) The synergy between defense and civil technologies seems increasingly illusive, calling into question the future appropriateness of traditional public policies for investing in defense technology while encouraging a healthy economy through a hands-off policy toward commercial technology. Historically the government's defense R&D was seen as offering opportunities for the civil economy to benefit indirectly from defense spin-off. Today we appreciate that "spin-on" may be as important - perhaps more important than spin off.

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* This testimony expands on ideas presented to the Senate Labor and Human Services Committee on April 6, 1989. It reflects ideas from a three year research program on Dual Use Technologies at the Harvard University Science, Technology and Public Policy program, supported by the Carnegie Corporation, the Sloan Foundation, MITRE corporation and other companies.

A more sophisticated approach to this question is to ask: Where are the most favorable opportunities for sharing - for both defense and civil applications - of significant elements of the Nation's science and technology system? What public policies might find the right balance between a shared industrial technology base serving both defense and civil needs and the continued specialization by single purpose institutions for each sector separately?

Observe that questions (1) and (2) deal largely with shortcomings of the process of innovation for the military and for civil industry separately, while question (3) deals with the relationship between the two. There is no a priori evidence that enhancing the synergy between defense and civil technology will solve the problems of excessive cost, poor quality or extended delays until Initial Operational Capability or successful market entry. Conversely, it may be true that searching for synergy between the defense and civil technology systems might not only increase efficiency but also help put right those short-falls in innovation in each sector separately.

The starting point for this analysis is to understand how dramatically circumstances have changed, both domestically and internationally since the 1950's and '60s. In 1960 the federal government invested $ 8.738 Billions in R&D, while private industry invested only $ 4.516 Billion. Of the federal portion, 80 percent was defense related. Thus for the first 15 years after World War II, the defense department was the dominant source of sophisticated technology in the United States - and for most of the rest of the world. High technology industry was just beginning to be a major force in the world economy.

Today circumstances have radically changed. In spite of a doubling of defense sponsored RDT&E expenditures during the Reagan years, private firms now out-spends the military on R&D by 50 percent and matches the government's total R&D investments. Defense-related R&D no longer dominates the national effort at home, and abroad our two most effective competitors - Japan and West Germany - outspend U.S. civilian R&D as a percentage of the Gross National Product, while devoting much smaller resources to military purposes.

Nevertheless, as the Congress debates the federal government's responsibilities for enhancing both economic competitiveness and military security, it is tempting to look to defense technology agencies for initiatives aimed at the industrial technology base. The Congress is still quite ambivalent about giving civilian agencies such as Commerce such a role, and the budget crisis makes defense all the more attractive as a surrogate for a national technology policy.

The Defense Department has responded to Congressional and its own concerns about loss of competitiveness in the commercial technology base by investing in semiconductor manufacturing equipment (through SEMATECH), high definition television (HDTV), "supercomputers", advanced software, electrooptics, manufacturing systems, and other selected areas.

The Defense Science Board in the fall of 1988 called attention to these concerns and recommends that the Secretary of Defense play a stronger role in economic policy and in measures to strengthen U.S. competitiveness in high-technology industrial areas on which defense increasingly depends. This committee has challenged the defense community to identify 20 strategic technologies, many of which are equally important to commercial industry, and thus qualify as "dual-use" technologies. There is little doubt that Defense could make greater contributions to meeting its own technology base requirements and at the same time provide a needed boost to commercial capabilities, thereby helping preserve the indigenous industries required to forestall foreign technological dependency.

It would be a serious mistake, in my view, to expect the Department of Defense to conduct surrogate industrial policy for the country, without carefully limiting its role.

First, defense department relations with industry have become even more adversarial than those of the civil agencies. The undoubted capacity of many defense agencies for managing high-tech R&D often leads them to micromanage, and ill suits the partnership relationship needed in industrial technology. Second, as the report of the American Electronics Association on HDTV illustrates, a successful public-private partnership to recapture lost industries or sustain threatened ones must address many issues other than R&D.

Finally, until defense can get its own acquisition house in order, including a radical improvement it its ability to inject incremental improvements in technology in its systems and deploy them in a timely manner, it is hardly in a position to teach commercial industry how to meet international competitive pressure. As the study by MIT [1] documents, those competitive pressures depend primarily on design and manufacturing performance, not R&D.

On the other hand, there are strategies that could enhance the Defense community's ability to defend the nation more economically while also providing positive stimulation to high-tech commercial industry. Such strategies will be most useful in so-called "dual-use" industries - those whose products find application both in defense and in commercial trade. Technologies that have increasingly strategic importance in defense systems, are also among the most important in civil high technology business. Examples are micro-electronics, computers, telecommunications, software, advanced materials, aeronautical propulsion, communications satellites, airframes, and complex systems engineering. More recently, biotechnology and even industrial synthetic chemistry have renewed military significance as potential threats.

The industrial base has been important ever since the mobilization of industry in World War II largely replaced pre-war military arsenals for weapons design and production. Traditionally defense industry has been thought of as composed of specialized companies dealing in weapons technologies that have few commercial counterparts. Why this new importance of dual use industries?

1) First, while there are major areas of defense technology that are totally unique to defense (a space-based x-ray laser powered by a nuclear explosion has little commercial attraction), the national security increasingly depends on capabilities also required in the civilian economy: systems for acquiring and analyzing information, for logistics management, for rapid deployment, for maintenance and repair, for communications, command and control.

2) Second, in many areas of high defense priority, commercial industry is advancing the rate of introduction of new technology faster than the military, and the technology flows not from defense to civil ("spin-off") but from civil applications to defense ("spin-on").

3) Third, this has happened in part because high-tech commercial industry has outgrown defense industry in the last 25 years. Since 1960, privately funded, commercial R&D has grown (in current dollars) by a factor of 12.78, while U.S. military R&D has grown by only 5.11. Thus, in the U.S., civil industrial R&D grew 2.5 times a fast as military R&D. In Japan and Germany, non-military R&D has grown in the same period to a higher fraction of GNP than in the U.S. - by a factor of 1.5.

A snap-shot of our defense industry in 1987 shows how deeply it is tied to commercial business:

- The no. 1 (in total prime contracts) defense contractor in 1987 ranked only no. 35 in the Forbes Sales 500.

- Among the top 100 defense prime contractors, the defense work of the 10 largest companies amounted to only 2.6% of their total sales.

- The prime contracts of 78 largest contractors averaged only 9.9 % of their total sales; only 12 had less than 50% commercial revenue, only 4 less than 25 %.

In 1987 these 100 prime contractors did $ 90 B in military work for the government (out of $ 142 B) and $ 909 Billion of total commercial sales -nearly a quarter of the GNP. One might imagine that their research laboratories, their technology and product development organizations and their manufacturing technology would synergistically support both the trillion dollar commercial market and the needs of our national security, insuring technological leadership of both.

Yet when we look at the relationship between these large manufacturing companies and the defense department, we find it seriously strained. Most of these companies keep their defense businesses at arm's length from their commercial businesses. They do this for a variety of reasons related to the military's unique way of doing business.

Some of the reasons are administrative and legal. The government insists on accountability procedures that are quite different from those in commercial usage. Security constraints must be respected. And companies which must open their defense books to government inspection do not wish to share their proprietary business information at the same time.

But even if these administrative and procedural barriers were not serious impediments to technology sharing between civil and military activities, there are major differences in the engineering style and technology strategies necessary for success in the two sectors. Some of these differences are displayed in this table:

Commercial Innovation	**Military Innovation**
- opportunistic, high risk introductions of new products based on new technology	- innovation constrained to requirements set by govt.
- fast response to new market conditions; fast new technology injection	- decade long programs, high cost for program changes
- premium on low cost manufacturing, high quality, high reliability	- premium on unique function and long shelf life
- premium on process technology to increase productivity for high volume rates	- premium on R&D to prove capability; low production rates; low volumes
- R&D, production and field engineering tightly integrated, interactive	- R&D contracted for in separate competition
- success based on proprietary technological advantage	- success may require sharing with second source

Under these circumstances, major shifts by government in acquisition policy, by industry in strategies for managing technology, and by defense in the relationship of requirements-setting, permissive costs and technology strategy my be necessary to bring to bear the full power of American technology on both economic and military security goals, and do it efficiently.

Six directions for improvement - all of which are well known to defense executives and enjoy some degree of priority today - are worth exploring:

1) Restore proportionate investment levels in 6.1 and 6.2 research categories to their 1980 levels.

That component of the defense RDT&E investment that is most readily shared by economic as well as military objectives is the defense technology base, especially the fundamental research (6.1) and exploratory development (6.2) categories. If defense is critically dependant on the high-tech industrial base, then the Defense Department cannot expect to continue to live off of the research investments of the past, but must re-invest its proportionate share in the common pool of technical knowledge and human skill.

During the major defense build-up of the last eight years these areas have not grown, whereas defense RDT&E as a whole (budget categories 6.1 through 6.6) has doubled. Operational systems development (6.6) grew in real dollars by a factor

3.13, manufacturing prototypes (6.3B) grew by a factor 2.46 and proof-of-principle prototyping (6.3A) grew by a full 586 percent.

This figure includes SDI, all of which is placed in budget category 6.3A, largely for political reasons. But even if SDI is subtracted, the 6.3A category grew by 202 percent. Fundamental research (6.1) grew only 16 percent - that is, 2 percent per year; exploratory development (6.2) actually shrank by 2 percent in the 7 year period.

In the 1990 budget before the Congress [2], in real dollars, basic research in non-defense agencies should grow by 4.5 %, but in defense - off of an almost equal base - it shrinks by 6.4 %. In Applied Research (the civil designation, roughly equivalent to 6.2), defense real budget authority shrinks by 8.3 %, and non-defense shrinks 3 percent. Development, on the other hand, continues its 8 year trend toward increasing dominance of the R&D budget: up by 6.7 percent in defense and 23.3 percent in non-defense.

In the fields of science and engineering most strongly supported by defense agencies, the basic and exploratory development budget of defense ($0.9 B in FY 1990 request) is about equal to the research budget of the NSF. The value to both defense industry and to commercial industry of reversing this systematic starving of the defense technical base becomes a matter of some urgency. The urgency becomes all the greater, when one appreciates that university research contributes importantly to 6.1 and 6.2 programs. The human resources required for our defense industry are to this degree hostage to the lack of growth in these components of the defense budget.

2) Adopt NASA's policy of encouraging defense contractors to commercialize technologies developed with their IR&D and SBIR funds, rather than punishing or discouraging it.

A recent informal survey by Dr. Charles A. Zraket [3], CEO of MITRE Corporation, of other defense company CEO's found that most of the firms surveyed found DARPA to be almost unique among defense agencies in the encouragement of commercialization of technologies developed under defense contracts. Elsewhere in defense it seems that sensitivity over the possible diversion of defense funds to private use outweighs the advantages to the government of having prime contractors invest their own resources in technology of use both in civil and defense markets.

One of the most controversial - and most difficult to understand - defense advanced technology programs is the Independent Research and Development (IR&D) program and the associated Bid-Proposal allowance. This program covers a very significant investment with the costs shared by government and industry. In 1987 the 100 largest defense contractors told the government they expected to spend $4.2 B on defense-relevant R&D, over and above any RDT&E contracts they might have. Government agreed that $3.0 B of this was of substantial interest to defense, and allowed these companies $1.77 B in indirect charges to their current prime contracts. The total amount authorized to be charged by DoD in 1987 for IR&D and BP was $3 B. Since most of this work is exploratory, advanced research, it represents a larger investment than the 6.1 and 6.2 R&D contract budgets combined. It should, therefore, have major leverage not only in preparing contractors for their next defense program, but in strengthening their capability to meet international competition in commercial industry.

In NASA's IR&D program, the agency not only permits IR&D funds to be devoted to projects of interest to both NASA and to the company's commercial interest; NASA gives positive credit for evidence of intent to commercialize. In the Defense Department, on the other hand, the diversion of government funds to private value is forbidden and even though the industry believes the funds in question to be their own and not the government's, the policy seems to be one of serious discouragement of overt efforts to take commercial advantage of defense-relevant IR&D.

In those areas of dual use technology of importance to defense, and especially those where defense is dependent on a faster-moving commercial base, this seems very counterproductive policy. Defense agencies quite properly evaluate IR&D proposals on their defense relevance. But having satisfied themselves on that ground, they should regard evidence of additional commercial investment to leverage the IR&D technology not as diversion of defense funds but as cost sharing that produces technology of still greater value to U.S. national security.

Studies underway at Harvard suggest that a similar problem exists with the Small Business Innovative Research (SBIR) program in Defense. While commercialization is not discouraged, it does not get the encouragement shown in the administration of the SBIR programs by NSF, for example.

3) Change the military requirements process to encourage bidders to offer modification to system requirements if they would bring large economies, and or attractive alternatives for satisfying military needs.

One of the most critical differences between military and civil industry is that the military customer is a monopoly buyer (monopsonist), which not only means that alternatives to traditional market forces must be found to simulate bidder competition, but also that the customer (Defense Department) is not as frequently exposed to more economical or more appropriate solutions to his problems that might be offered by alternative suppliers. Instead requirements are set and then bids taken; the vendors have limited opportunities to device solutions to military problems that maximize performance-to-price ratios.

I do not suggest that the rational establishment of requirements should not precede the solicitation of bids. Even today, many of the exposures in our force structure derive from lack of interoperability of weapons systems and from overlong persistence in traditional approaches reflecting the institutional parochialism of the services. A robust requirements system is necessary to overcome these problems.

The problem arises when the requirements process becomes too rigid -either in refusing to accommodate a radical departure from traditional thinking or from failure to entertain trade-offs of function and cost that might be highly beneficial. A commercial customer can chose among a wide variety of competitive offerings which vary both in the nature of the solution they offer and also in the cost-performance design points of these solutions. He can select the product that does enough of what he needs at minimum cost. The equivalent process in a monopsonistic market requires give and take between the buyer and the vendors.

The military system to often presents the requirements as a rigid, take it or leave it challenge to bidders. The bidder, who might have a civil technology base and set of commercial products of a similar nature to those needed by the military, is not encouraged to present a bid that might perform 90 % of the function for, let us say, 60 % of the cost.

The defense department has begun to experiment with design-to-cost contracting, in which the incentive structure is much more like that of the commercial market. The case for this approach is well made by Jacques S. Ganzler in his new book **Affording Defense** [4].

4) Review the full range of MILSPEC standards to seek maximum compatibility with commercial engineering standards.

Military product and component purchase and test specifications ("MILSPECs") play a very important role in defense technology and have not only quality impact but cost impact as well. In many cases MILSPECs are more rigorous than commercial industrial standards and are necessary to assure satisfactory performance in hazardous environments. When a military system is bid, the bid documents are thousands of pages thick. They would be even thicker if component specifications could not be stated by simple reference to a MILSPEC number. If the MILSPEC is needlessly specific or restrictive it may not endanger meeting systems requirements, but it will certainly needlessly raise costs. MILSPECs had their origin in a time when commercial industry lagged military technology and built to rather casual reliability and quality standards. That circumstance has changed radically. Executives at NIST have informed us that reliability requirements seen by manufacturing establishments they have visited are toughest from customer firms competing in world trade; the requirements from military and traditional domestic civil manufacturing are rather comparable. Indeed the modern practise of engineering applied to large volume, low cost commercial production provides great incentives for the use of computer aided design, with the computer programs that drive manufacturing equipment automatic-ally written and electronically transferred to the factory, where digitally controlled process tools make the product. In this situation the process and test standards are not just "nice to have"; they define the manufacturing process. For this reason, great advances in industrial standards have been made.

In the most fast moving high-tech industry - information technology - the standards process has outrun the normal (slow) procedures. The International Standards Organization has had to set up a special system for informatics standards, and both firms and governments are negotiating anticipatory standards which will not only define technologies; they will define markets as well.

Meanwhile military standards and test specifications increasingly diverge from the commercial alternative. An example is in the connectors and packaging technology for assembling integrated circuit chips into computers. In the 1950's and 1960's when defense investments in electronics and computers helped build the industry, similar packaging technologies were used in both civil and military markets. By the 1970's commercial industry began innovating ceramic packaging to meet higher requirements for reliability in interconnections and higher power dissipation. Then the Japanese exploited a U.S. packaging invention called "surface mount" for consumer products, now common as a cost reduction approach in computers. The military standards definitions are caught between the need for parts interchangability and the desire to move with the technology improvements from industry. Since the military systems are usually around for a decade or more (and take a decade to develop before initial operation) it is almost inevitable that MILSPECs and commercial standards will diverge.

The value of greater test specification compatibility for the military is, of course, even more emphasized by the fact that for many dual use technologies the commercial market is much bigger than the military one. In industries where this is conspicuous (computers, for example), important firms like Hewlett Packard and Digital Equipment Company decline to undertake custom business from the Department of Defense. Where standards are more compatible, the modification to one's production line necessary to meet government military requirements is much reduced, decreasing setup costs and reducing the disadvantage the military have of being a niche market for many important technologies.

5) Provide significant incentives for the production of "civil off-the-shelf" (COTS) products for use in military systems.

Another approach to increasing the accessibility of defense buyers to commercial dual-use vendors is to facilitate the sale of their standard line of products, minimally modified for military use. This approach is called "Civil Off-the-Shelf Technology". A COTS product may be thought of as a good example of "spin-on" - a commercial product that may be turned to a military application.

Of course there are many products for which this compatibility exists. The best example is the petroleum fuel and lubricant industry. In this case almost all the jet fuels and aircraft lubricants used by civil airlines are bought to specifications that are essentially identical with military specs. The fact that these oil company sales to the military are at commercial costs is of course due to the fact that jet engines for civil and military aircraft are very similar, and in some cases such engines are good examples of "COTS" products.

There are many examples of stimulation of high-risk commercial technology of defense importance through imaginative procurement policies. The U.S. super-computer industry owes much of its growth in the 1960's and '70s to the eagerness of weapons laboratories - especially Los Alamos and Livermore - to purchase the first production model of new supercomputers. A sophisticated and highly motivate buyer, the laboratories helped develop critical software and their orders reduced the risk and up-front costs associated with the introduction of new super-computers.

An excellent example of the advantages of COTS procurement is given by the mid-sized computer industry. The advantages of using industry standard computers goes far beyond the relatively low cost and frequently upgraded technology they offer. All of the industry software now become available for use by the military without the immense expense of custom software production except for unique defense requirements. In the mid 1980's IBM offered the "MIL-370", a midrange Model 370-4341 computer packaged to meet military environmental specifications. In 1988, the Raytheon and Digital corporations went one step further in the concurrent announcement of a new line of commercial VAX model processors from Digital and a completely compatible MILVAX from Raytheon.

In this case through cooperation between the two companies Digital shared all the design information for the new VAX with Raytheon which implemented it in configuration appropriate for military use. The Raytheon product is priced only 30% above the equivalent commercial computer. In this case the Digital company gets royalties on their product and the advantage of greater defense use of Digital computer environments. Raytheon gets a computer product that is quite competitive with a minimum of R&D expense. The government gets a solution optimized to defense needs while minimized in cost. Note that this was in response to a business opportunity plan of the two companies, not a government contract from a military requirement.

6) Ensure that manufacturability is a central feature of systems design, if necessary by removing the 1986 procurement act requirement to separate contract competitions for R&D from production.

In the interest of increasing competition for production contracts the laws governing defense acquisition were modified in 1986 to require a new competition for production after the completion of successful R&D. The firm that won the R&D contract was never guaranteed they would win follow on production; that would depend on their costs. But the prime R&D contractor certainly had an inside track. Under the new rules the barrier between the R&D phase and the manufacturing phase is raised even higher that it was previously, with the consequence that the designers of new weapons systems have even less incentive than before to take manufacturability into account when they design.

This is already the biggest difference between defense and commercial innovation. Military systems are developed according to the traditional "linear model" of innovation - a time-consuming sequence of steps beginning with research and innovation, proceeding through applied research, product development, production engineering and manufacturing. In highly competitive commercial industry, these steps proceed more concurrently; manufacturing technology must be considered very early in exploratory development or competitive costs will never be achieved.

If it is possible for provide incentive for defense manufacturers to invest in highly productive manufacturing facilities and evolve them with each new product development, their capabilities would be much closer to those needed for civil competitiveness and the likelihood of "spin-on" form the commercial side of their business would be much enhanced.

* * *

Pursuit of these six policies does not address the primary barrier to increased synergy between commercial and military technology. This barrier is inherent in the forces that induce prime contractors to insulate their civil and military subsidiaries from one another. It is unrealistic to expect these disincentives to shared technology to be eliminated entirely. Security concerns, the use of Government-owned facilities, and the specialized nature of many military products will not disappear.

However, much progress could be made if defense agencies joined with commercial firms in reforming their management practises and their approach to design and production to gain the advantages so evident in the best international commercial practise. How far from the best commercial practise in manufacturing are our defense industries? The market fails to provide the test. We build warships in U.S. yards that long ago gave up competing with Japanese, Korean and Brazilian shipyards for commercial ship construction.

The Department of Defense must accept the reality that its contractors' primary business will - in most cases - be the production of goods for the world non-military markets. They have accepted the challenge to compete with the best manufacturers in the world. Unless the defense agencies accept the challenge to reform their research, development, and acquisition practises to adopt "best practise" approaches, the most competitive firms will turn away from defense work, and the weaker ones will fade away and become unavailable as well.

[1] M. L. Dertouzos, R. K. Lester, and Robert M. Solow, **Made in America**, Cambridge MA: MIT Press, 1989.

[2] **AAAS Report XIV: Research and Development FY 1990**, Washington DC: Am. Assoc. Advancement of Science, 1989.

[3] C.A. Zraket, lecture to Dual Use Technology Seminar, Harvard University, April 11, 1989.

[4] J. S. Ganzler, **Affording Defense**,
Cambridge MA: MIT Press, 1989, see esp pp. 229-231.

Senator BINGAMAN. Thank you very much for that testimony. I believe you have some excellent suggestions that we can follow up on with some questions.

Now Mr. Sikes who is the Assistant Secretary of Commerce for Communications and Information, and you are here, as I understand it, to give us the Department's assessment on some of these issues and how cooperation between various departments can be improved.

We are pleased to have you here.

STATEMENT OF ALFRED C. SIKES, ASSISTANT SECRETARY FOR COMMUNICATIONS AND INFORMATION, NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE

Mr. SIKES. Thank you, Mr. Chairman. I would like permission to submit the longer version of my testimony for the record and abbreviate my testimony.

Senator BINGAMAN. We will be glad to include that.

Mr. SIKES. I would also like to say at the outset that I have sat through the first panel and now Dr. Branscomb's testimony and have found it quite interesting and quite enlightening. I am here for a much narrower purpose than the witnesses who have preceded me, to talk more specifically about high-definition television, which has become a bit of a surrogate or symbolic issue in respect to competitiveness generally and dual-use technology more specifically.

I head, as you noted, the National Telecommunications and Information Administration, and we have two fundamental responsibilities that relate to the subject that I am going to testify about.

First, we have a statutory responsibility to manage the Federal Government's own use of the radio frequency spectrum. Second, we are charged with developing and recommending national communications policies which will further the United States' economic and technological advancement.

In the past, communicating via radio involved a fairly straightforward tradeoff. The more information you wanted to transmit, the larger the channel or pipe had to be or, to use communications jargon, the more bandwidth was needed.

For example, a regular AM radio broadcast signal will use channels which are 10 kilohertz wide. To broadcast an FM radio signal, where higher sound fidelity is sought, the channel is 200 kilohertz wide or 20 times as much. To broadcast standard television, where you need to transmit much more information in addition to sound—signals relating to color, movement and the like—you need channels which are 6 megahertz wide or some 600 times larger.

The advent of semiconductors and advanced information processing techniques, however, has changed that traditional bandwidth versus information loading equation. Today you can process the information using computers before you transmit it and in effect pack the radio channels more densely.

By using the power of computers, in other words, you can send more information per channel than customarily has been the case.

Now any of the 20 or so approaches to HDTV that have been suggested involve transmitting much more information than we currently do. Instead of the 525 lines that are scanned on the conventional U.S. TV screen today, for instance, there could be a requirement to handle double that or much more.

At the same time, there are necessary limits on the size of the channels or pipes that can be allocated to broadcast television. Given all the demands for radio spectrum today, it is not realistic to expect that dramatically more bandwidth will be available for HDTV purposes. There are technical and opportunity cost considerations.

In order to accommodate HDTV to realistic spectrum limitations, therefore, all of the various pieces of equipment which are involved in the process will have to have a significant information or signal processing capability. The estimates vary, but some experts maintain that the average HDTV set of the future will contain as much as 30 times the semiconductor capacity as personal computers today, in large part because of radio frequency spectrum constraints. In other words, HDTV will have to be a very semiconductor intensive undertaking.

The fact that HDTV will necessarily have significant effects on the semiconductor business is one of the reasons for the Commerce Department concerns. Semiconductors, as many experts have noted, are the basic building blocks for our emerging information age society.

Now I know that Dr. Fields and others have testified about semiconductors, and so I am going to skip and talk now about other considerations in the area of high-definition television. The expert financial and marketing analysis that NTIA commissioned some time ago, for example, suggested that the total cumulative U.S. home market for just HDTV receivers and video cassette recorders over the next 20 years may be as much as $140 billion.

This has international trade implications. As Secretary Mosbacher has testified, consumer and other electronics are a significant part of the United States-Japan trade imbalance which exceeded $52 billion or nearly half of our international trade deficit of $118.7 billion last year.

To the extent that HDTV proves a fast growing consumer electronics market dominated by Japan-based companies, as some experts contend, there is a potential that our current imbalance with Japan will widen.

Experts have also stated, moreover, that HDTV technology will find widespread application in a variety of other electronic products ranging from medical imaging equipment to computer workstations. If just some of the industry forecasts submitted to Congressman Markey's Telecommunications Subcommittee in the House prove correct, the failure or inability of U.S. industry to participate in HDTV and related commercial developments has serious potential implications for the U.S. electronics industry generally.

The U.S. share of world electronics productions has significantly decreased over just the past 5 years according to statistics recently published by the Electronics Industry Association. We have gone from a world market share of 50.4 percent in 1984, for example, to 39.7 percent last year. Over that period, U.S. electronic companies experienced an 8 percent revenue increase, but Japanese companies enjoyed a 75-percent increase. It is important that we do what we can to reverse this trend.

Approximately 3 years ago NTIA began an examination of HDTV developments and their implications. In addition to addressing our communications policy concerns, we also wanted to make sure that a broad spectrum of American industry understood the full implications of HDTV developments.

Our trading partners have been working on HDTV applications for many years. In Japan, the state-owned broadcast system, NHK, has worked closely with Japanese Government and industry for some 20 years to develop HDTV systems. The same has been true in a more recent context in Europe.

The United States faces challenges. Since GE's sale of its own and RCA's television manufacturing operations to the French Government-controlled Thomson organization, the U.S. TV manufacturing base has attenuated to a single major firm, Zenith.

U.S. companies command both substantial expertise in many of the pertinent HDTV technologies as well as very considerable capital resources. The companies which are involved in the American Electronic Association's HDTV study effort, for example, enjoy a cash flow which collectively exceeded $24 billion last year. American companies, in short, have much of what is needed both in technology and capital to be competitive in this emerging field.

The price of not being competitive may be increasing commercial dependency. Recently I had a top executive of a major U.S. computer company tell me that his firm had not taken much of the rhetoric that HDTV has engendered very seriously until late last year. Then they tried to buy high-resolution monitors to incorporate into some of the advanced computer systems which they market.

What they discovered was that the only suppliers which responded to their request for proposals were Japan-based, vertically integrated companies that also compete with them in the end computer system market. They were faced with the prospects, in other words, of having to buy a key part of their overall system from their competitors.

At the President's request, Secretary Mosbacher is now leading an administration review of HDTV issues. In addition to Commerce heading a working group of the Cabinet level Economic Policy Council, the Secretary has convened a special HDTV advisory committee comprised of industry CEOs to make sure that private sector views help drive government policies.

Almost from the outset of our efforts, we have been working with Dr. Fields in the Department of Defense. His advice has been invaluable, and he has also contributed significantly to our work through his membership on the Secretary's advisory committee.

Through this cooperative effort we have gained further understanding of the link between economic and national security. We have also come to appreciate some of the challenges the Defense Department could potentially face if the absence of a strong and competitive U.S. semiconductor and electronics industry obliges them to buy too many one-of-a-kind systems to meet national defense needs.

At present, the Bush administration is reviewing a wide range of proposals for Government action in addition to the funding which DARPA earlier announced. No decisions have been reached regarding what, if any, additional steps may be needed. Before such decisions are made, we plan to continue close consultation with U.S. researchers, Congress, and the business community.

While I cannot say exactly what decisions will be made, I would like to make a basic point. It is important that the Government not go ahead of the private sector in this case, for it is the private industry which has to assess the risks and rewards of HDTV business opportunities and to compete for success in the marketplace.

When he addressed a joint session of Congress this past February, the President noted that a strong and growing economy enhances the security of the Nation. The President has also remarked on how national security cannot be achieved through military means only, but also depends on the fundamental strength of our free enterprise economy.

The Department of Commerce believes that HDTV and related technologies will have a significant impact on our economy. We will benefit if American industry actively participates in the development of this field, and we will be less well off if we become economically and technologically dependent on our international competitors.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Sikes follows:]

Statement of

Alfred C. Sikes
Assistant Secretary for Communications and Information
National Telecommunications and Information Administration
U.S. Department of Commerce

Mr. Chairman and Members of the Subcommittee:

Thank you for inviting me. High-definition television (HDTV), which I understand is an issue of particular concern to the Subcommittee, is an important development which spans across a number of Commerce Department responsibilities.

It potentially affects our domestic and international communications policymaking responsibilities, our trade and technology programs, our long-term interests in the electronics industry, including our efforts to revitalize the semiconductor industry, and our duty to control and license the export and reexport of dual-use (military and civilian) commodities and technical data. 1/

With your permission, this morning I would like to emphasize some of the reasons why HDTV has been a major focus of the National Telecommunications and Information Administration, the Commerce Department agency which I head. I would then like to review briefly some of initiatives which we have taken in this area, and to indicate why HDTV has become a priority concern for Secretary Mosbacher.

Origin of Concerns

NTIA has two major responsibilities which are relevant here. First, we have statutory responsibility to manage the Federal Government's own use of the radio frequency spectrum

And, in coordination with the Federal Communications Commission (FCC), to establish the overall "Table of Allocations" for the United States. [2] It is that Table, and the regulatory system which is built around it, which basically apportions radio frequency spectrum among all the various uses -- television, radio, cellular radiotelephone, satellites, and so forth. The Table, in other words, largely determines how much of this sought-after national resource will be allotted for what Government and private sector radio communications purposes.

Second, NTIA is charged by Executive Order 12046 with developing and recommending national communications policies which will further the United States's economic and technological advancement. In that regard, we conduct studies and research, for example, into issues such as the convergence of communications and computer technologies. Over the past years, moreover, we have worked closely with Commerce's International Trade Administration (ITA) and other Government agencies on a variety of communications trade and related topics.

The HDTV Connection

How does HDTV fit in with NTIA's responsibilities? Well, in the past, communicating via radio involved a fairly straightforward trade-off: the more information you wanted to transmit, the larger the channel or "pipe" had to be -- or, to use communications jargon, the more "bandwidth" was needed.

For example, to broadcast a regular AM radio signal, we use channels which are 10 kilohertz wide. To broadcast an FM radio signal, where higher sound fidelity is sought, the channel is 200 kilohertz wide -- 20 times as much. But to broadcast standard television, where you need to transmit much more information in addition to sound -- signals relating to color, movement, and the like -- you need channels which are 6 megahertz wide, or some 600 times larger.

The advent of semiconductors and advanced information processing techniques, however, has potentially changed that traditional bandwidth versus information "loading" equation.

Today, you can process the information using computers before you transmit it and, in effect, pack the radio channels more densely. By using the power of computers, in other words, you can send more information per channel than used to be the case.

Now, any of the 20 or so approaches to HDTV that have been suggested involve transmitting much more information than we currently do. Instead of the 525 lines that are scanned on the conventional U.S. TV screen today, for instance, there could be a requirement to handle double that requirement or more.

At the same time, there are necessary limits on the size of the channels or "pipes" that can be allocated to broadcast television. Given all the demands for radio spectrum today, it is not realistic to expect that dramatically more bandwidth will be made available for HDTV purposes. There are technical and opportunity cost considerations. We cannot, in other words, simply increase the size of the broadcast pipe.

In order to accommodate HDTV to realistic spectrum limitations, therefore, all of the various pieces of equipment which are involved in the process will have to have a significant information or signal processing capability. The estimates vary, but some experts maintain that the average HDTV set of the future will contain as much as 30 times the semiconductor capacity as personal computers have today. Based in large part on radio frequency spectrum constraints, in other words, HDTV will have to be a very semiconductor-intensive undertaking.

Semiconductors and Spin-Off Applications

The fact that HDTV will necessarily have significant effects on the semiconductor business is one of the reasons for Commerce Department concerns. Semiconductors, as many experts have noted, are one of the basic building blocks for our emerging "Information Age" society. They constitute a critical component of everything from personal computers, to grocery store scanners, to automated bank teller machines, to today's sophisticated automobiles. As Dr. Fields will explain, moreover, semiconductors are a major ingredient of virtually all of today's sophisticated weapons and command systems.

American defense strategy for decades has rested on the expectation that we can harness our technological prowess to compensate for conventional manpower and materiel advantages any potential adversaries might enjoy. As former Deputy Defense Secretary Clements once put it, we've assumed that if we can't out-build our adversaries, we can out-smart them.

But semiconductors, and the significant demand for them that HDTV potentially represents, have further implications. The expert financial and marketing analysis that NTIA has commissioned, for example, suggests that the total cumulative, U.S. home market for just HDTV receivers and video cassette recorders (VCRs) over the next 20 years may be as much as $140 billion. 3/

This has international communications trade implications. As Secretary Mosbacher has testified, consumer and other electronics were a significant part of the U.S./Japan trade imbalance which exceeded $52 billion -- nearly half of our overall international trade deficit of $118.7 billion -- last year. 4/ To the extent that HDTV proves a fast-growing consumer electronics market which is dominated by Japan-based companies, as some experts contend, there is the potential that our current imbalance with Japan will expand.

Experts also have stated, moreover, that HDTV technology will find widespread application in a variety of other electronic products, ranging from medical imaging equipment to computer work-stations. If just some of the industry forecasts submitted to Congressman Markey's Telecommunications Subcommittee in the House prove correct, the failure or inability of U.S. industry to participate in HDTV and related commercial developments has serious potential implications for the U.S. electronics industry generally.

The U.S. share of world electronics production has significantly decreased over just the past five years, according to statistics recently published by the Electronics Industry Association. We have gone from a world market share of 50.4 percent in 1984, for example, to 39.7 percent last year. Over that period, U.S. electronics companies experienced an 8 percent revenue increase; but Japanese companies enjoyed a 75 percent increase. It is important that we do what we can to reverse this trend.

Commerce Initiatives

More than three years ago, NTIA began an examination of HDTV developments and their implications. In addition to addressing our communications policy concerns, we also wanted to make sure that a broad spectrum of American industry understood the full implications of HDTV developments.

Our trading partners have been working on HDTV applications for many years. In Japan, the state-owned broadcast system, NHK, has worked closely with Japanese Government and industry for some 20 years to develop HTV systems. Indeed, one experimental system has already begun broadcasting in Tokyo, and this experiment will begin in earnest with multi-site operations in June of this year. In Europe, one part of the European Community's overall EUREKA program, which aims at ensuring Europe's technological progress, involves developing HDTV. Two of the world's largest manufacturers of television sets, Philips and Thomson, are actively involved in that government-sponsored research effort.

The United States faces challenges. Since GE's sale of its own and RCA's television manufacturing operations to the French Government-controlled Thomson organization, the U.S. TV manufacturing base has attenuated to a single major firm, Zenith. But U.S. companies command both substantial expertise in many of the pertinent HDTV technologies, as well as very considerable resources. The companies which are involved in the American Electronics Association's HDTV study effort, for example, enjoy a cashflow which collectively exceeded $24 billion last year. American companies, in short, have much of what is needed to be competitive in this emerging field.

Potential Commercial Dependency

The price of not being competitive may be increasing commercial dependency. Recently, I had a top executive of a major U.S. computer company tell me that his firm had not taken much of the rhetoric that HDTV has engendered very seriously -- until late last year. Then, they tried to buy high-resolution monitors to incorporate into some of the advanced computer systems which they market. What they discovered was that the only suppliers which responded to their request for proposals were Japan-based, vertically integrated companies that also compete with them in the end computer systems market. They were faced with the prospect, in other words, of having to buy a key part of their overall system from their competitors.

Similar instances have been cited by other U.S. companies. They have been confronted with the prospect of dependency on foreign-based competitors for what some have called "choke-point" components and technologies.

Ongoing Efforts

At the President's request, Secretary Mosbacher is now leading an Administration review of HDTV issues. In addition to Commerce heading a working group of the Cabinet-level Economic Policy Council, the Secretary has convened a special HDTV advisory committee comprised of industry CEOs, to make sure that private sector views help drive Government policies here. We are also continuing to work with the Federal Communications Commission through its HDTV advisory committee, of which I am a member ex officio.

Almost from the outset of our efforts, we have been working with Dr. Fields and the Department of Defense. His advice has been invaluable, and he has also contributed significantly to our work through his membership on the Secretary's HDTV advisory committee.

Through this cooperative effort, we have gained further understanding of the link between economic and national security. We have also come to appreciate some of the challenges the Defense Department could potentially face if the absence of a strong and competitive U.S. semiconductor and electronics industry obliges them to buy too many "one-of-a-kind" systems to meet national defense needs.

At present, the Bush Administration is reviewing a wide range of proposals for Government action in addition to the funding which the Defense Advanced Research Projects Agency (DARPA) earlier announced. No decisions have been reached regarding what, if any, additional steps may be needed. Before such decisions are made, we plan to continue close consultation with U.S. researchers, Congress, and the business community.

While I cannot say exactly what decisions will be made, I would like to make a basic point. It is important that the Government not get ahead of the private sector in this case, for it is private industry which has to assess the risks and rewards of HDTV business opportunities, and to compete for success in the marketplace.

Conclusion

When he addressed a Joint Session of Congress this past February, in conclusion, the President noted that a strong and growing economy enhances the security of the Nation. The President has also remarked on how national security cannot be achieved through military means alone, but also depends on the fundamental strength of our free enterprise economy. [5]

The Department of Commerce believes that HDTV and related technologies will have a significant impact on our economy. We will benefit if American industry actively participates in the development of this field, and we will be less well-off if we become economically and technologically dependent on our international competitors.

Thank you, Mr. Chairman, and I would be pleased to address any questions which the Subcommittee might have.

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[1] Under the legislative authority of the Export Administration Act of 1979, as amended, controls on dual-use technologies are maintained for reasons of national security, foreign policy, and short supply. See Public Law 96-72, 93 Stat. 503, 50 U.S.C. App. 2401 et seq.; amended by Public Law 97-145, Dec. 29, 1981 and Public Law 99-64, Jul. 12, 1985.

[2] 47 U.S.C. 305.

[3] See Economic Potential of Advanced Television Products (Darby Associates: Washington, D.C., Apr. 7, 1988). See also Advanced Television, Related Technologies, and the National Interest (NTIA: Washington, D.C., Mar. 3, 1989).

[4] See Statement of Commerce Secretary Robert A. Mosbacher before the House Telecommunications and Finance Committee on High-Definition Television and Other Advanced Television Systems, Wednesday, Mar. 8, 1989, at p. 3.

[5] See, e.g., 25 Weekly Comp. of Pres. Docs. 178 (Feb. 9, 1989); 25 Weekly Comp. of Pres, Docs. 236 (Feb. 25, 1989).

Senator **Bingaman**. Thank you very much.

Senator Gore has another appointment he has to go to, and he wanted to make a statement and perhaps ask a few questions, so I will defer to him at this point.

Senator **Gore**. Thank you very much, Mr. Chairman.

I want to begin by complimenting and congratulating you on the structure of these hearings, the way you have conducted them and the inquiries that our subcommittee has been making. I regret that I was not able to be here for a couple of the earlier witnesses and that our schedules here these days have gotten to the point where it is difficult to stay as long at each of these meetings as you would like, even extremely important ones like this one.

I chair the Science, Technology, and Space Subcommittee on the Senate Commerce Committees, and this afternoon at 2 p.m. we are having a hearing specifically focused on HDTV. I am introducing legislation today with regard to HDTV which I would like to briefly refer to in a moment, and then later this week I am introducing a much more comprehensive bill on the subject of supercomputing.

I believe very strongly that we must have a proactive Federal Government role in stimulating the ability of the United States to compete effectively in these two fields, high definition television and supercomputing.

I have appreciated these two statements here. Dr. Branscomb, as a fellow Tennessean, you are always most welcome. I enjoyed our recent conversation at the Kennedy School of Government. Your reference to the SBIR program was also pleasing, because I had the opportunity to author that program when I was chairman of the House Science and Technology investigating subcommittee.

I found your testimony, Mr. Sikes, on HDTV interesting as well.

Let me make a general philosophical comment and then focus briefly on these two subjects. First of all, when should the Government play an active role?

My family and I have just gone through a difficult experience when our son was injured. We are thankful that he is better now. When he went to the hospital, I engaged in a lengthy dialogue with his doctors, and among the things I found was that 10 years ago a child with his injuries would have been the object of much more surgical intervention than is the case today. They would have automatically removed a kidney, removed his entire spleen and taken other steps.

In the intervening 10 years, they have learned that the body has the capacity to heal itself in some circumstances to produce outcomes that are generally better than those which can be expected after surgical intervention.

About 2 days later he experienced a period of internal bleeding that was worrisome to the doctors, and if they had not had experience and training but had instead relied upon his mother and me, then we would have advised waiting and hoping that this injury, too, would heal itself. They had the skill and experience and knowledge, however, to know that this time intervention was required, and they saved his life.

To use that as an analogy, we should learn from the past and understand that sometimes we have intervened too much in our economy, and we have hurt some industries and sectors of our economy with unintended consequences and ill-advised interventions.

When we can clearly see, however, a situation demanding intervention, we must have the intellectual courage to intervene.

Now believing in the free market and the robust ability of market forces to make decisions in our economy that Government cannot make, I want to limit the occasions on which the Government intervenes. When it is obvious to all with eyes to see, however, that a particular industrial effort is critical to our economic future and that the patient is going to die if we do not intervene, then we have to have the intellectual courage to intervene.

I believe that is the case with both supercomputing and HDTV. Now I am going to talk at some length later this week on supercomputing, and one of the provisions of that legislation involves the construction of a nationwide network of information super highways with a capacity of between 3 to 10 billion bytes of information per second connecting advance computing centers in every part of this Nation with the equivalent of interchanges where information-related businesses and university researchers can cluster to communicate with their counterparts in other locations throughout this great Nation.

Our current transmission capacity has bottlenecks typically measured at 56,000 bytes per second. The economics are dominated by voice streams of data. Increasingly, computer data flows capture a larger part of the capacity, but still the flows are relatively small.

Supercomputers are the steam engines of the information age. That is the new cliche. But if they communicate one with another, the data streams for graphics and moving visualizations require up to 10 billion bytes of information per second.

We have the inherent capacity along many links. We do not have the electronics, the switches, the software or the last mile. I passed 3 years ago a legislation called the Information Super Highway Network Study Act, which put in place the Fix It Report and various other measures. We are now in a position to move. I have passed out copies of the legislation, and I will talk about it at the hearing this afternoon.

It requires from the Commerce Department within 90 days a comprehensive and detailed report on the establishment of an HDTV industry. I will not go through the details.

Today I want to talk about HDTV.

HDTV

Mr. Sikes, your department is in a very awkward position. The Secretary backed out of my hearing this afternoon, and I believe it is because your department knows the extent of the problem and the rough outlines of what is needed to solve it, and yet what is needed is felt by others in the administration to be inconsistent with their ideological view of the proper boundaries of government's role.

Am I right in assuming that?

Mr. SIKES. I think you would be correct to say that the various agencies are not of one mind; that you would find differing points of view across the agency front.

I think you would also be correct to state that the Department of Commerce, Secretary Mosbacher specifically, regards this as a matter of major importance and believes that some intervention is necessary.

Senator GORE. Well, that is a yes, and I appreciate the graceful way in which you managed to say yes.

You know, if 40 to 50 percent of the next generation chip is going to be found in this one single product and if one country or group of companies dominates the architecture of that product and specifies the nature of the chips required for it, then they have the clear advantage in quickly attaining the economies of scale which are especially powerful in chip construction.

Economies of scale, after all, simply represent a ratio of front end investment costs to raw material and operating costs. With these new chip factories, it may be $400 to $500 million to build the fabricating facility, and sand is not that expensive. As Jay Leno says about the Doritos, "Don't worry, we'll make more".

When they get the economies of scale, they drive everybody else out of the business. Then another effect kicks in. They are able with a hammer lock on that generation of chip to control the rest of the electronic food chain that depends upon those chips, not just HDTVs then but the computers, the data processing industry, the other remaining parts of consumer electronics that we do not now control and increasingly avionics and other defense-related applications.

So Mr. Chairman, thank you for your indulgence in letting me intervene in the hearing. I appreciate the chance to serve with you on this subcommittee and wish I could stay for the rest of the proceeding but I cannot.

I do look forward to this afternoon's hearing specifically on HDTV and the events later this week on supercomputing and appreciate the chance to be here.

If either of you want to comment on my diatribe, you are welcome to do so.

Senator BINGAMAN. Would either of the witnesses like to make a statement?

Dr. BRANSCOMB. Well, I would like to at least compliment Senator Gore on his point of view and make a response on the issue of when to intervene.

I think you are right, that Government wants to intervene with great selectivity and, even more important, be well prepared; that is, to understand the issues before it intervenes.

Over the years, back in the 1960s I can remember a number of efforts in the Commerce Department and civilian industrial technology. If you look back at what the Department tried to do in those days, it was ludicrous. It was well intended, but it was ludicrous in terms of its relationship with the companies.

I do think it is important to appreciate that in some sense it is a mistake not to intervene very early in the sense that you take a problem seriously before it gets past the point of no return.

I referred earlier to this new MIT book, "Made in America". They did a study, I think a very good one, on the history of the U.S. consumer electronics industry and what happened to it. Their point is that the trouble began not when we lost the technology lead—and maybe we have not lost that yet—or when we lost the market share. It began when our companies were suffering from dumping and the courts actually awarded $600 million worth of remedy to the affected companies and the State Department negotiated it down to $60 million. That is when we should have started to get our act together.

My view is that even in HDTV today, while I think it is appropriate for DARPA to stimulate the industrial collaboration that their relatively modest investment represents, the important issue is that the various parts of this Government, of the private sector standards bodies and of the commercial interests must get together for a strategy that says how are we going to provide the media environment in our society, recognizing that some parts of it are regulated by the FCC and some parts are not regulated. We still need a consensus—there is no strategy. There is no plan. Everybody has their own ideas.

Senator GORE. That is why this legislation on HDTV that I am putting in today starts with the plan and requires the Commerce Department to present the plan. It specifies in intricate detail the elements of the plan that we want to hear back from the Department on.

Are you prepared to endorse that this morning, Mr. Sikes?

Mr. SIKES. I think I will at least wait until I have seen it, Senator.

Senator GORE. Well, that is probably prudent. I am sure it will just take a brief glance.

Thank you both very much.

Senator BINGAMAN. Thank you, Senator Gore.

Let me just follow up for a minute.

This is the tough issue politically. Is a necessary part of that plan a willingness to cordon off a portion of our market for U.S. producers?

Dr. BRANSCOMB. Probably not. I was generally favorable to the editorial in the New York Times yesterday morning on HDTV. The second part of that editorial supported the idea of limited antitrust protection for this industry, recognizing its situation. The editorial said if we give them antitrust exemption or coverage for this particular purpose, perhaps for a limited time, it is very important that the market be kept open; that is, the protection for the U.S. consumer interest is an open market. We should allow others to bring product in.

Senator BINGAMAN. Let me go into detail on that issue for a moment.

JAPANESE SCALED-UP PRODUCTION CAPABILITY

Considering where the Japanese manufacturers are in their development of this product and considering where we are in our development of this product and the investment that has been made on the two sides of the ocean on this general subject, the traditional way that the Japanese electronics industry has dominated particular products, just from my layman's view of it, is they develop their local market in Japan, their domestic market where they scale up their production capability, and then they go worldwide and compete at whatever price they need to compete at.

Now that is going to happen with HDTV, and the U.S. manufacturers are not going to be in the position to compete with that scaled-up production capacity that has been developed in an essentially closed market in Japan.

Now maybe I am wrong, but I think my own sense is what I read in the same editorial. I have it right here. "Should Uncle Sam Tilt HDTV?" It is a great theory. In my view, we can put all the money we want into research, we can put all the money we want into subsidizing loans for the construction of production capacity, we can do all of it, but at the end of the process we have to have a situation where a U.S. manufacturer can sell his product at a profit and keep the thing going. I do not know if that is going to be possible if we do not ensure them some share of this market.

Dr. BRANSCOMB. I am not ideologically opposed to protection under all circumstances. In this particular case it seems to me it is not obvious exactly how this market develops.

First of all, it is far from clear to me that the United States should endorse the primary dependence on direct broadcast satellite as the means for distributing HDTV, which is the Japanese and the European plan.

We have 1,400 independent television stations in this country, every one of which has local program origination. So I think that helps explain why the industry woke up when they clearly recognized that the Japanese direct broadcast approach is perhaps not the appropriate way or certainly not the only way or the main way we will get into it.

Second, I happened to spend yesterday morning at MIT's media laboratory with Mrs. Thatcher's science advisor visiting their HDTV work, which is very interesting. I was impressed with the fact that they point out that they did a study in which they brought people in out of shopping centers to look at a television set and to answer the question how much more money would you pay for a TV set that looked like this instead of the one you have at home.

To half the people they showed an HDTV receiver being fed by very high quality video tape. To the other half they showed a conventional American broadcast television receiver, again with a very good picture on the tape. The people all said we will pay $100 more for a set that will do that. The same number and the same percentage of them said it for both sets.

The point is that most Americans get a lousy picture. They get a lousy picture because the channel reliability is very poor. We make very poor use of the channel band width, as you pointed out. The technology is here to allow us to get a good picture, and the public will pay more for a good picture, but it is not at all clear that the public will pay the $3,000 that it is now estimated to cost, at least in the early years, for an HDTV receiver.

I am not sure that HDTV receiver is the market issue that is most immediately on the table. I think the real agenda is the perception in Japan that the world is about ready to make a transition from primary dependence on film for media production to a dependence on electronic cameras and electronic production facilities.

The meeting of the CCITT last week in Europe on HDTV was a discussion of standards for production equipment for studios. What the ITU has to say about that is unclear to me, why they are even discussing it, but they were. Some of the experts believe it may be quite a while before Hollywood abandons film. Film is still a lot superior to television.

We have a certain amount of time. If we had a consistent, credible national plan that was primarily industry's plan and depended primarily on industry's money, but it needed some legislative and perhaps some technology and antitrust help, one component of it could give us some industry protection for a brief period of time. If that protection would not run the cost up so much as to make the consumer not want to buy this product, I think the Japanese would understand it.

I do not think the Japanese respect our chaotic way of making decisions over here. They have made strategic protection decisions that were limited and they have eventually backed off from them when they did not need to anymore. I think they will understand it.

So I am not utterly opposed to protection, but I think it is premature at this point to protect an industry that has not yet stood up and volunteered.

Senator BINGAMAN. I appreciate that comment very much.

SUPERCOMPUTING

Let me switch to the issue of supercomputing.

Dr. Branscomb, are you in a position to make recommendations with regard to what should be done in that area as well? Is this an area where the industry needs to come forward and define it?

Some of the earlier testimony was that we have a decent plan there. The question is are we going to have the will go forward and implement it and, if so, when?

I do not know if this is something you have really looked into, but I would be interested in any comments you have and those of Mr. Sikes also.

Dr. BRANSCOMB. First, I am concerned about the supercomputer industry because while we debate these issues in Washington we observe companies dying. I got a call last week and a letter from the chairman of Control Data informing me that they were getting out of the business but they intended to maintain the technological leadership of the company in its residual businesses.

I then received a letter from the vice president for research enclosing his curriculum vitae because the corporate research organization and his position had been dissolved.

I got a call from the president of ETA Systems, which is their very ingenious small supercomputer company which has not yet turned profitable, and he said that while they had been shut down they were only $10 million away form being able to do a leveraged buyout. He still had the top 75 people around and hoped they could somehow salvage the company but it really needed customers.

The big leverage that the Government has had—was not what the Government contributed to the technology in supercomputing. It was what they contributed as an intelligent, highly motivated consumer. And Los Alamos scientific laboratory absolutely did what we heard this morning. It was the purchasing power of the Government buying supercomputers and, importantly, having technical experts do the buying so that they were themselves a contributor to a part of the technology that perhaps matters most, which is utilization. That had a major role.

I think so long as the Government continues to be an active risk-taking customer for these machines, then we can expect the industry to do pretty well.

I also think it is important to appreciate that the commercial market for supercomputing is bigger than the scientific market. This is not a part of the market that the Government can help with a lot except through a very careful inspection of how it handles export controls. The supercomputer market is a limited market for very big, very expensive machines, and unless you can sell them to the world market without impediment you cannot expect to be in the business.

So it is essential that the Congress ensure that none of our export controls intended to protect security affect our large supercomputer exporters worse then they affect Hitachi, NEC and Fujitsu.

Senator BINGAMAN. Mr. Sikes, did you want to make a comment on the supercomputer issue?

Mr. SIKES. No, I do not.

COMPETITIVE PRODUCTION

Senator BINGAMAN. Lets bring up a different issue here, I believe, Dr. Branscomb, you were pointing out that we have a need to perhaps rationalize our procurement system so that the contractor that does the development actually goes forward with production. Of course, we have in the Competition in Contracting Act a real incentive the other way, which is essentially that we take the product that has been developed and put it out to competitive production.

One way out of this has been this teaming arrangement where two or more contractors work in the development of a particular product. I do not know whether you have thoughts about whether that holds some promise for getting out of this box, or if there is another way to get out of this box. Obviously the Competition in Contracting Act was intended to get us cheaper, better quality products, and I think there is some evidence that it has been successful.

Do you have any thoughts as to how we reconcile the need to keep the same company involved and still get the best possible deal we can get?

Dr. BRANSCOMB. I think the design-to-cost approach has promise in the sense that it is hard to see how you could respond to that without a solid manufacturing plan. Otherwise, I do not know how the R&D vendor would demonstrate costs.

Second, I think the teaming approach may well be appropriate. There are clearly two motives for second sourcing. One is to maintain competition in order to try to get the minimum price, and no doubt it is effective for that. The second is to provide assured availability in the event the first contractor goes out of the business.

To the extent that the designs of systems avail themselves of commercial manufacturing technology, it may be easier to find multiple potential vendors. That is one point.

The second point is that it may be sufficient to try to ensure that in the funding of the RDT&E and the R&D phase the manufacturing planning is included and paid for, so that one is able to judge much more accurately what costs are likely to be and what the manufacturing technology is likely to be. In other words, move the interface a little further down the R&D chain toward initial production and then make the big volume production decision after giving the contractors the opportunity to build a limited number of manufacturing valid production models.

Senator BINGAMAN. I may have another question or two that I want to get to you in writing before we complete the record in this hearing, but I very much appreciate your testimony. I think it has been very useful, a lot of good suggestions, and we will try to follow along with them.

Thank you very much.

[Questions for the record with answers supplied follow:]

QUESTION SUBMITTED BY SENATOR ERNEST F. HOLLINGS

IMPACT OF HDTV ON SEMICONDUCTOR INDUSTRY

Senator HOLLINGS. At the end of the May 16 hearing, questions were raised regarding the actual impact HDTV is likely to have on the semiconductor industry. Any estimates that you or your staff could provide us on this matter would be very useful.

Dr. FIELDS. A key finding quickly emerged as a result of our work—it became clear that the loss of a U.S. consumer electronics industry has eroded the ability of American semiconductor manufacturers to compete effectively with their global counterparts. This point has been demonstrated repeatedly over the last several years by a number of government, industry and academic studies. The NACS strongly believes it is vital for the United States to re-enter the consumer electronics industry in a timely manner as a means to sustain our semiconductor industry's competitive position and to regain its global leadership. It is the judgment of the NACS that the establishment of a viable and robust U.S. HDTV industry could provide one of the single most important elements in a successful re-entry strategy.

We believe HDTV will serve as a critical technology driver for the semiconductor industry, and will strongly influence competition in related industries as well. HDTV and related equipment will utilize significant numbers of DRAMs, microprocessors, signal video and image processing chips associated with receiving and displaying HDTV. For example, a typical HDTV receiver would likely utilize at least 24 megabits of DRAM, and that amount could quadruple for HDTV receivers that incorporate sophisticated multi-screen and manipulation and enhancement capabilities.

Indeed, the American Electronic Association (AEA) estimates that in 1992, a typical HDTV would contain $250 worth of semiconductor devices. The AEA further predicts that as HDTVs replace standard NTSC sets in large numbers, this would represent a substantial source of revenue for the U.S. semiconductor industry.

HDTV will also create important technology spill-overs into other industries which are driven by semiconductor technology, and in turn serve as vital markets that pull semiconductor technology development. These include: computers (advanced high resolution flat panel displays), telecommunications (fiber optic networks), auto electronics (compact flat panel displays), military display applications and other defense systems. All of these industries are critical to our economic and national security and are facing competitive threat from abroad.

For example, HDTV technology will have an important role in computer displays and componentry. We strongly believe that the country/companies that develop and successfully market HDTV computer platforms will be in a strategic position to dominate the computer industry and significantly impact the semiconductor industry as well.

QUESTION SUBMITTED BY SENATOR LLOYD BENTSEN

Senator BENTSEN. Please supply for the record a description of the R&D efforts by the military services—outside of DARPA—on display technology and receiver technology. When available, please include budget numbers.

Dr. FIELDS. The attached list is representative of past DOD R&D efforts in the area of display technology. There has been little, if any, R&D on receiver technology other than generic signal processing which perhaps has some indirect ties. Budget numbers are being compiled and will be available soon.

[Whereupon, at 11:35 a.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

WEDNESDAY, MAY 17, 1989

U.S. SENATE,
SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

DEFENSE INDUSTRIAL BASE

The subcommittee met, pursuant to notice, at 9:31 a.m., in room SR-222, Russell Senate Office Building, Senator Jeff Bingaman (chairman of the subcommittee) presiding.

Committee members present: Senators Bingaman, Nunn, Wirth, and Wallop.

Professional staff member present: William H. Smith.

Minority staff members present: Jonathan L. Etherton and Judith A. Freedman.

Staff assistant present: Kelli J. Pronovost.

Committee members' assistants present: Edward M. McGaffigan, Jr., assistant to Senator Bingaman; Jefferson B. Seabright, assistant to Senator Wirth; Jack D. Crouch II, assistant to Senator Wallop; and Charles Pearcy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR JEFF BINGAMAN, CHAIRMAN

Senator BINGAMAN. We will go ahead with the hearing.

The subcommittee meets today to continue to receive testimony on the defense technology and industrial base. We had a similar hearing yesterday. Today we will direct our attention to defense industrial base issues and our ability to exploit the products of our technology efforts.

When this subcommittee was formed 3 years ago, the close connection between technology and production was recognized and the subcommittee's charter covers both areas.

The problems that exist in our ability to process and manufacture are equal in difficulty and complexity with those of developing the technology. Neither can be ignored; both must be pursued vigorously. The problems facing the United States in its ability to be competitive in the defense industrial base are multifaceted in policy, in organization, culture, law, and international relations. There are no simple solutions and no easy answers to these problems.

If we wish to maintain our position as leader in the Free world, we need to accept these challenges and implement the solutions to deal with them.

We welcome the recommendations we will receive today on what Congress should do and not do to assist in this effort.

Today, we again have five highly qualified witnesses testifying in two panels. The first panel will be comprised of Mr. Richard Donnelly and Mr. James Blackwell.

The National Defense Authorization Act for 1989 addressed a number of key industrial base issues and directed the Secretary of Defense to undertake a number of policy and analysis actions.

Also, in July of last year, the Under Secretary of Defense for Acquisition submitted his report to the Secretary of Defense on bolstering defense industrial competitiveness. That report contained a number of important recommendations on how the Department could effectively improve the operation of its manufacturing and production sector.

We have asked Mr. Richard Donnelly, the Assistant Deputy Under Secretary of Defense for Industrial and International Programs, to provide us with an assessment of the Department's progress on these activities and recommendations.

I was pleased to co-chair a study conducted over the last year by the Center for Strategic and International Studies on the defense industrial base. Mr. Fuhrman and Norm Augustine, who are also testifying today, were on the steering committee for the study. On Monday of this week we held a press conference where Senator McCain and I released the study report.

Dr. Jim Blackwell, who directed the CSIS effort, is here today to testify on the report's findings and make his observations and recommendations.

That is the opening statement that I had prepared. At this point, let me just see if Senator Wirth has an opening statement he wants to make, and then we will go on to the panel.

Senator WIRTH. Very briefly, Mr. Chairman, I want to thank you once again for your attention to this important issue. I think all of us are beginning to become concerned about what effect a declining Defense Department budget will have on our valuable defense industrial base. The question I think we must ask is: Are we going to manage that decline well, or is it going to be a kind of freefall?

I have to duck across the road, Mr. Chairman, to an Energy Committee markup on the deregulation of natural gas, an issue that I know is near and dear to your heart. I will be back later this morning.

Thank you for your attention to these sensitive issues.

Senator BINGAMAN. Thank you.

Why don't we go ahead? Mr. Donnelly, do you want to start out? And then, Dr. Blackwell.

STATEMENT OF RICHARD E. DONNELLY, ASSISTANT DEPUTY UNDER SECRETARY OF DEFENSE FOR MANUFACTURING AND INDUSTRIAL PROGRAMS

Mr. DONNELLY. Thank you, Mr. Chairman. I appreciate the opportunity to discuss our activities related to the industrial base. I do have a statement for the record and I would prefer to summarize my remarks.

Senator BINGAMAN. That would be fine.

Mr. DONNELLY. I think we all realize that the competitiveness of U.S. industry is a complex issue, and it involves many factors beyond the reach of the Defense Department, but that is not to say we do not have interest.

I read the other day, and I am not sure you received a copy of it yet, a recent study by MIT. They had a commission on industrial productivity, and they supported much of the findings that this committee has had in the past, and some of the Defense Department's work. It stated the decline in competitiveness of U.S. firms was, to a large degree, the way American businesses have continued to operate, despite a changing global environment, and the globalization that is going on. Exchange rates and tax policy, the cost of capital, and labor/management relations, and industry's willingness to plan for the long-term growth instead of short-term profits all affect the competitiveness of American-made products.

After bashing industry, I think we should make the statement that there is plenty of blame to go around. There are many government policies that need to be looked at very carefully to see how they might be able to be adjusted.

The trade policies of other countries can undermine domestic industries as well, when the goal of those countries is to gain market share in the United States by dumping goods at unreasonably low prices.

I would just add parenthetically that I think there is some room for improvement on the ability of the U.S. Government to react to these dumping issues. We need to be more prompt in our utilization of the authorities we have to counteract dumping.

But by mentioning these factors, I do not mean to minimize our concern for the condition of the industrial base. We do believe we have a contribution to make, and I believe we are making it. We do have, even though our budget is declining, some records indicating that we account for over 20 percent of the manufacturing GNP in the Nation. So our strategy is to use our leverage as a major customer to try to make some improvements.

I might mention also a quick definition of the defense industrial base. I would offer that there is none; and that there is basically a commercial industrial base in the country and DOD is another customer or consumer in that resource, a claimant, if you will. But, to the extent that commercial base becomes unproductive, unviable, impacted by import penetrations, then so go our acquisitions from the base, and thus our concern.

To help American manufacturers regain their competitive edge, we outline a strategy in the Bolstering Industrial Competitiveness Report that you mentioned earlier. I am sure the committee is familiar with that report, so I will not take your time this morning to tick off all the various recommendations that are in there. I do assure you that we are using the Bolstering Industrial Competitiveness Report, and Dr. Costello's guidance before he left, as our baseline for our efforts in the future.

I would like to touch on one element, the Defense Manufacturing Board, and of course, you will hear from Tom Murrin shortly, who is chairman of that board.

We are very excited about the progress the board is making. They are already into over 13 programs and projects. And through the leadership of Mr. Murrin, I know that we can count on the deliverable not being yet another study, but something that we can take to the bank. We are very excited about the progress they are making.

We are also promoting the concept of total quality management, or TQM. My statement contains examples of cost savings and production gains that can be accomplished through TQM. We would be delighted at some future time to provide more information to you on the progress of that program and where we believe it is going over the next few years.

Let me just say a couple of quick words about mobilization and sustainment. One of the key things that the Bolstering Industrial Competitiveness Report recognized is that we need to have a better link between the military operational plans of the CINCs, the commanders in chief, and the response of U.S. industry.

While I know this committee is aware of that situation, the general public is not particularly aware that there is not a tight link between the ability of U.S. industry to support our emergency plans. We are trying to forge a tighter link among the war fighters and the U.S. industrial base response.

That goal was also emphasized by the Congress in the 1989 Authorization Act. The act specifically requires the Defense Department to establish and implement policies requiring an analysis of the capability of the defense industrial base to develop, produce, and maintain and support each major defense acquisition program.

The Congress also required an analysis by September 30, 1990, on one major weapon system, not yet in production; one analysis by each of the military departments. We are working with the services to do that.

We have also established a Joint Production Base Analysis Group, with representation from each of the services, the defense agencies, and the JCS. That group is responsible for establishing some new policies and procedures for assessing the ability of the industrial base to support the demands of the operational plans in war fighting.

Related to this effort are issues concerning foreign mergers and acquisitions. My formal statement also goes into detail on these issues, discussing our interest in foreign investment in the United States; also the interest we have on the pros and cons of mergers and acquisitions, and the rapidly changing industrial infrastructure.

But one of the things we have learned along the way is, in many areas, we do not know what we do not know. There is an overriding need for more visibility into the U.S. industrial infrastructure and the structures overseas as well.

An important tool for providing information on mergers and acquisitions and these other industrial base issues is a system called the Defense Industrial Network, or DINET. I believe we discussed this system briefly with the subcommittee in the past.

I can report to you now that DINET has now become operational. It is not a full-up system yet, but certainly it has been used in some areas already. It is still in its infancy, but it can be used to identify alternate suppliers, provide corporate profiles, identify prime and subcontractors. The data that the system produces can be arrayed in a variety of ways, including geographic location, various countries' contractors, the Federal supply classes of items being produced, and so forth.

We used it a few weeks ago in an earthquake exercise that we ran over at National Defense University, where we assumed a catastrophic earthquake on the west coast on the order of 8.3 on the Richter scale. DINET was used to identify the key defense-related manufacturing facilities in that area, and also to identify alternate sites and so forth.

So it is a useful system for peacetime procurement strategies as well as emergency response and recovery.

A system related to DINET is one called Project Socrates. I believe the committee is aware of that one as well. Basically, Socrates lets us take a look at the technology base worldwide.

As an example, let us say that we had an industrial base problem for, perhaps, ball bearings, and we wanted to develop a world-class U.S. ball bearing industry—not that one does not already exist, but let us say that we wanted to do that. Socrates will permit us to look at, in this case, the attributes of ball bearing production, and ask, what country and company has the best automated material-handling techniques? Who uses robotics? Where is the best grinding technology in the world for bearings? It also lets us create what a world-class industry should look like. Then we can use that compendium of information to buy our bearings in the future.

We need to know where it can be done and who has the best. There is a globalization going on here and we need to take advantage of it wherever possible.

Mr. Chairman, there is a little bit more information in the statement on the DOD Manufacturing Technology Program which has been around for a decade or two. It is a high payoff program. It takes manufacturing techniques that are proven in the lab and lets us scale them up so they can be put on the factory floor.

The Industrial Modernization Incentives Program is discussed in the statement as well. These are two key efforts that enhance U.S. industrial capability, and we would like to see those programs continue and grow.

I am not satisfied that the tools that we do have, like ManTech and IMIP, and Title III of the Defense Production Act, and other efforts, are linked well enough yet to the technology voids that are being identified through, for example, the report on the 22 key technologies. We need to do a better job of strategic planning in linking these various systems together.

We know where our 215 top industries are, but there is not yet, to my satisfaction, the link that we need among all these various lists, items, and tools.

Mr. Chairman, that completes my statement. I would be pleased to answer any questions you may have.

[The prepared statement of Mr. Donnelly follows:]

TESTIMONY BY

RICHARD E. DONNELLY

ASSISTANT DEPUTY UNDER SECRETARY

FOR

MANUFACTURING AND INDUSTRIAL PROGRAMS

Mr. Chairman and members of the committee, thank you for giving me the opportunity to discuss Defense Department activities relating to the industrial base. In response to a perceived decline in the competitiveness of American manufacturing, the Defense Department issued a report in July 1988 entitled "Bolstering Industrial Competitiveness." The report was issued because of the importance attached to the condition of the industrial base and the repercussions a declining base has on our ability to produce the weapons and materiel needed for national defense.

We need to realize that competitiveness is a complex issue involving many factors beyond the reach of any Defense Department policy or program. Exchange rates, tax policy, the cost of capital, labor-management relations, and industry's willingness to plan for long term growth instead of short term profits all affect the competitiveness of American made products. The trade policies of other countries can undermine domestic industries if the goal is to gain market share in the U.S. by dumping goods at unreasonably low prices and, while the Defense Department needs to be aware of such trading practices, correcting them is the responsibility of other government agencies. Education is another area affecting competitiveness. A modern workforce needs the education, skills and training required to manage increasingly complex technology.

A recent study by the Massachusetts Institute of Technology concluded that the decline in competitiveness of U.S. firms was due largely to the way American businesses have continued to operate despite a changing global environment. Specific areas mentioned in that report are: the pursuit of outdated strategies, short term horizons, failure to integrate manufacturing, design, and quality, neglect of human resources, and the lack of cooperation between labor and management, suppliers and customers, and individual firms within a given industry. These are problems that essentially only industry can solve.

By mentioning these factors I do not mean to minimize our concern for the condition of the industrial base or our involvement in ways to improve it. The intent is to put the issue of Defense Department involvement in its proper perspective. Although we have limited influence over most factors affecting competitiveness, we do believe we have a contribution to make. The "Bolstering Industrial Competitiveness Report" found that defense purchases account for over 20 percent of manufacturing GNP. Our strategy is to use our leverage as a major customer to ensure U.S. manufacturers are world class competitors.

Although there is frequent mention of a defense industrial base, it is important to note that the U.S. has only one industrial base. We do not have a defense industrial base that is separate and distinct from the commercial industrial base. The ability to produce military weapons and equipment depends upon the strength of the industrial infrastructure supporting defense contractors. Even though many military products have no commercial counterparts, the resources needed to produce them are generally the same ones found in the commercial sector. It is the commercial industrial base that provides the machinery, equipment, components, materials and workforce needed to manufacture defense products. Without a healthy civilian industrial sector capable of furnishing these resources, our defense industrial establishment will be a hollow shell.

These resources include the research resources needed for developing and exploiting new technologies as well as the manufacturing resources needed to produce existing products. Most people are familiar with the concept of "spin off" where military research transfers to commercial production, but there is another concept which can be called "spin on." This is where commercial technologies are modified to meet a military requirement. As an example, optical fiber was developed primarily for commercial communications but is being adapted for military purposes. It's interesting to note that the Japanese are actively pursuing the concept of "spin on" in their military production.

To help U.S. manufacturers regain their competitive edge, the DoD outlined a strategy in the "Bolstering Industrial Competitiveness Report" mentioned earlier. A significant thrust of this strategy involves forging the right relationship with industry, a broad concept that incorporates several programs and initiatives. The concept also addresses one of the competitiveness issues concerning government-industry relations raised in the MIT study alluded to earlier.

As part of our strategy to forge better relations with industry, a new Office of the Deputy Under Secretary for Industrial and International programs was created. The new Deputy Under Secretary provides a focal point for manufacturing within the Department of Defense by serving as a Production Base Advocate. The new organization also recognizes that we cannot afford to become insular and that competitiveness must be addressed within a global framework because the success of deterrence depends, to a large extent, on the strength of our alliances. Combining domestic manufacturing concerns with the need for international cooperation provides the balance needed to ensure our policies do not become counterproductive. We must not forget that our objective is to deter aggression by effectively competing with our adversaries. The new Office of the Deputy Under Secretary allows economic competition with our allies to be viewed within the context of a global security scenario.

Another initiative to foster better relations with industry is the formation of the Defense Manufacturing Board, which is chaired by Tom

Murrin. The Board is chartered for two years as an advisory body to the Under Secretary of Defense for Acquisition on matters relating to manufacturing technology, quality, the industrial base, and productivity. Modeled after the Defense Science Board, membership consists of leading experts in manufacturing from industry, academe, and labor.

The Board has four standing committees: a Human Resources Committee chaired by Mr. David Bing, Chairman of Bing Steel, Inc.; an Industrial Base Committee, Chaired by Mr. Howard D. Samuels, President, Industrial Union Department, AFL-CIO; a Quality Committee, Chaired by Mr. Christopher B. Galvin, Senior Vice President, Motorola, Inc.; and a Technology Committee, Chaired by Mr. William P. Brown, President, McDonnell Douglas Helicopter Company.

The Board's first meeting, held on October 12, 1988, focused on the implementation of solutions to problems hampering industry's ability to support defense needs. Each member had an opportunity to present a perspective on problems and to propose potential solutions. From this initial dialogue and a subsequent meeting, the Board's agenda for the coming two years has emerged. Thirteen projects have been approved by the Under Secretary of Defense for Acquisition ranging from the formulation of DoD policy on Foreign Ownership/Control to development of a National Coalition for Manufacturing Education. A complete list of projects is at attachment A.

We recognize that a competitive manufacturing base needs to produce quality products so we are promoting the concept of Total Quality Management or TQM. This concept relies on a concern for quality at all levels within an organization. Key features of a TQM program are:

- Management commitment to continuous improvement.
- Emphasis on preventing rather than detecting defects.
- Focus on the processes for producing products and services.
- Encouragement to foster innovation and application of new technology and procedures.

- Application to all administrative, engineering, and manufacturing processes.
- Orientation toward satisfying both internal and external customers.

We feel the concept of TQM should apply to the way the Defense Department does business. For example, using TQM principles the Navy Aircraft Overhaul Facility at Cherry Point increased productivity 73 percent in the grind-plate-grind process, reduced engine test failures by 90 percent and reduced inspection rejects of helicopter rotor hub repairs by 80 percent. This facility was recently recognized by OMB for its TQM achievements. Impressive accomplishments have also been made in the F-14 overhaul program at the North Island Naval Aviation Depot in San Diego. Labor expenditures have been reduced an average of 7,540 man hours per aircraft, and material expenditures reduced an average of $108,465 per aircraft. Implementation of Statistical Process Control on the COPPERHEAD and the PATRIOT warheads programs resulted in an 80 and 94 percent reduction in machining operation defects, respectively.

On August 30, 1988, the Under Secretary of Defense for Acquisition directed the implementation of TQM in the acquisition process and called for a climate, in both Government and Industry, that would foster and enhance TQM implementation. Current procedures and regulations base product acceptance solely on verification of compliance with specifications. A transition will have to be made from this method to a new approach which validates and controls the processes that produce the end product. Toward this end we have embarked on a Qualified Manufacturers List (QML) program, which provides a disciplined approach for assessing a supplier's capability to consistently produce high quality products.

A master plan and associated guidelines containing the management infrastructure to begin the actual practice of TQM has been issued and training for top and middle management, which is essential for effective implementation, has begun.

The Defense Department's interest in the industrial base arises from the need to satisfy the materiel requirements of military operations. A number of studies found industry's ability to produce the materiel needed to mobilize and sustain these operations to be declining. The "Bolstering Industrial Competitiveness Report" recognized that more needs to be done to link production capabilities with operations planning. The close relationship between industrial capabilities and the conduct of military operations was emphasized by Congress in the 1989 Defense Authorization Act by establishing new planning and analysis requirements.

The Act specifically requires the DoD to establish and implement policies requiring an analysis of the capability of the defense industrial base to develop, produce, maintain, and support each major defense acquisition program. To test and develop techniques, each Military Department is to perform an analysis by September 30, 1990, on one major system not yet in production. We are working with the Services to identify logical systems from those presently in development and scheduled for review by the Defense Acquisition Board. Detailed guidance and methodologies will be developed for the conduct of the analyses. During the conduct of the analyses, we will work with the system program managers to refine the approach.

To improve the overall Industrial Preparedness Planning and Production Base Analysis processes, which principally address systems already developed and fielded, we have established a Joint Production Base Analysis working group, with representation from each of the Services, the Defense Logistics Agency and the Joint Staff. That group will be formulating new policies and procedures for assessing the ability of the defense industrial base to support the production demands associated with military operational planning and warfighting.

Related to this effort are issues concerning foreign mergers and acquisitions. When a defense contractor merges with, or is acquired by, a foreign company, the affect can be negative for the domestic industrial base. Technology can be transferred to another country, security compromised, competition reduced, and the capability to perform research that improves existing products or develops new ones lost. However, mergers and acquisitions can also have a positive affect by providing an influx of capital, advanced technology, and improved manufacturing processes to the firm being acquired. The current review process for mergers and acquisitions of Defense contractors and subcontractors involves five interest areas: industrial base, competition, contracting, industrial security and technology transfer.

The Defense Technology Security Administration (DTSA) is the Defense Department's lead office for reviewing foreign acquisitions of, and investments in, U.S. companies. DTSA also reviews detailed information on the technology of the company being acquired and represents DoD at Committee on Foreign Investment in the U.S. (CFIUS) meetings.

Foreign acquisitions of U.S. defense contractors having potential national security implications are examined by industrial security personnel. Foreign controlled firms are generally not eligible for a facility security clearance and under no circumstances does DoD permit a U.S. firm under foreign control to have unrestricted access to classified information.

Those involved in assessing the impact of takeovers on the U.S. industrial base begin by establishing defense contracting profiles of the companies involved. Of interest is geographic location of plants and facilities, the items being produced, activities buying the items, weapon systems containing the items, and contracts received. There is also interest in whether industrial capacity or capability will be lost. Past experience has shown that some manufacturing plants were converted to marketing offices or closed entirely as a result of a takeover.

Awareness of pending mergers and acquisitions comes primarily from DoD agencies, civilian agencies, and public sources. The Defense Investigative Service (DIS), through their cleared facilities program, requires over 14,000 defense contractors and subcontractors with "cleared facilities" to notify DIS of any changes involving foreign influence within a firm. Through the Hart-Scott-Rodino Antitrust Improvements Act of 1976 (15 U.S.C. 18a), the Justice Department and Federal Trade Commission (FTC) receive advance notice of all pending mergers over $15 million, including mergers between foreign and U.S. firms. A notice is required to be filed 30 days prior to consummation of the deal.

Since passage of the Trade Bill, U.S. and foreign companies have begun to notify the President, through the Treasury Department, of proposed acquisitions. Although this notification is not required, once it is made, a series of mandatory deadlines are created. The U.S. government must provide a formal response indicating whether or not it intends to investigate the acquisition within 30 days of receipt of the notification. The DoD position must therefore be transmitted to Treasury within 25 days to allow for interagency discussion in the CFIUS. If the U.S. Government decides to investigate, it has an additional 45 days to do so. At the end of the 45 days, the CFIUS provides a recommendation to the President who then has an additional 15 days to decide whether to use his authority to prohibit or suspend the acquisition. DTSA solicits the views of DoD Components in order to prepare a consolidated DoD position which is then provided to the CFIUS.

An important tool for providing information on mergers and acquisitions is an information system called the Defense Industrial Network (DINET). This is an information system designed to support policy formulation related to the industrial base and was one of the initiatives mentioned in "Bolstering Industrial Competitiveness". Still in its infancy, DINET can be used to identify alternate suppliers, provide corporate profiles, and identify prime contractors. Data can be arrayed in a variety of ways, including geographic location, foreign country, contractor, Federal Supply Class, and weapon system. In a recent earthquake exercise, DINET was used to identify defense contractors in Southern California.

Another system, Project SOCRATES, addresses the need for technology strategic planning, a process for making decisions based on technology available throughout the world. SOCRATES provides data on the capabilities of technologically significant countries and compares the comparative position of U.S. industry to other nations in various technologies. Relative position is measured in "years ahead" or "years behind." We hope to merge DINET and SOCRATES into a natural language expert system giving planners and policymakers an easy-to-use tool for analysis and strategic planning.

With regard to defense production, the Defense Department has two programs for improving productivity. One of these is the Manufacturing Technology or ManTech Program. ManTech was established in the late 1950's in response to the need for advanced manufacturing processes. ManTech's primary goal is to improve the productivity and responsiveness of the defense industrial base by participating in the development of advanced manufacturing technology which will permit DoD and its contractors to produce materiel more efficiently.

Each Military Department has a mature ManTech program and the Defense Logistics Agency recently established one. Coordination is accomplished thru the Manufacturing Technology Advisory Group (MTAG) which consists of an executive committee and six technical committees. Once a year, the MTAG holds a plenary meeting for the entire DoD ManTech community. Attendance has grown to over 600 with two-thirds coming from the private sector.

ManTech has until recently been funded at about $200 million per year. DoD's FY 90 request is for approximately $170 million. While DoD invests in the development of advanced technology, DoD contractors are expected to invest in the capital equipment needed to bring the new technology to the factory floor.

Some ManTech funds are used internally by organic DoD activities, but most of the projects funded each year are awarded to private sector contractors. In-house funds are used primarily in those sectors where the DoD owns the industrial base because there is no civilian counterpart. Examples are the technologies needed to produce ammunition, large caliber weapons, and tracked combat vehicles.

The ManTech program has had a number of successes. One illustrative example involves the development of a laser welder for producing tank engine components which is more productive and produces higher quality welds than previous methods. It is estimated that the $1 million ManTech investment produced a cost avoidance of $3.5 million. Another project successfully established a more efficient method of producing gallium arsenide integrated circuit substrate material. It has been estimated that the new process paid for the ManTech investment in less than the first month of production. All three Military Departments are benefiting from this project.

ManTech program results are distributed to defense contractors in a number of ways. One of the most effective is the end-of-contract briefing. These briefings give attendees the opportunity to see results first hand and take back to their businesses what they have learned. The distribution of technical reports by the sponsoring organization and/or contractor is another way results are shared. Reports are also deposited centrally at the Defense Technical Information Center (DTIC) which provides secondary distribution. DTIC's services were augmented in June 1984 by the establishment of a Manufacturing Technology Information

Analysis Center (MTIAC) which serves as a focal point for DoD's manufacturing technology information. MTIAC also answers queries on various technology subjects and prepares technical assessment reports such as: 1) higher order languages for robots; 2) artificial intelligence and expert systems applications in manufacturing; 3) evaluation of finite capacity scheduling and simulation systems; and 4) automated inspection systems for flexible machining systems.

The Industrial Modernization Incentives Program (IMIP) is the other vehicle used by the DoD to help defense contractors boost productivity. IMIP was established as a DoD program after successful implementation in the Air Force as Tech Mod and Get Price to promote contractor investment for improved industrial productivity and competitiveness. The program benefits both government and industry because both share in the savings that result from increased efficiencies.

The Air Force currently has the most aggressive IMIP. An Air Force investment of $533 million in the program plus an additional industry investment of $1.3 billion is expected to reduce direct outyear manufacturing costs by approximately $4.1 billion.

Efforts are underway to motivate the other Services and DLA to make greater use of the program. The Army and DLA programs are budgeted in FY90 for the first time in many years. Navy policy presently requires the contractor to provide all funding for IMIP projects and although several prime contractor modernization efforts were very successful using this strategy, the policy has prevented the Navy from obtaining all the benefits IMIP can provide, including modernization at subcontractor facilities.

The DoD recognizes the importance of the domestic industrial base and has taken the measures discussed to ensure it remains strong, innovative, and responsive to our requirements. The fact that the condition of the industrial base concerns both buyer and seller means we need to work together resolving the problems before us.

I appreciate the opportunity to discuss these matters with you and will be happy to answer any questions.

ATTACHMENT A

DMB PROJECT LIST

- Strengthen DOD Manufacturing Training
- Implementation of Bolstering Industrial Competitiveness
- National Coalition for Manufacturing Education
- Accelerate Implementation of Total Quality Management
- Promote Malcolm Baldridge National Quality Award Process
- Commercialize DOD Soldering Requirements & Practices
- Develop DOD as World Class Customer
- DOD Strategy for HDTV
- Foreign Ownership/Control
- Defense Industrial Strategic Plan
- Accelerate DOD Utilization of Concurrent Engineering
- Top Priority DOD Manufacturing Investment Strategy
- Technology Transfer policies

Senator BINGAMAN. Before we go on to Dr. Blackwell, let me call on Senator Wallop, who is the ranking member on the subcommittee, to make any statement that he would like to.

Senator WALLOP. If I may, I would just like to put my statement in the record, and thank you for holding the hearing. And I join in welcoming the witnesses.

I guess the more interesting thing I have heard yet is something that I suspected; it is that we have no real definition yet for what constitutes the defense industrial base. It is sort of having a massive national industrial policy devoted solely to defense. We are not likely to get anything much more specific than Mr. Donnelly's excellent statement.

I look forward to hearing Dr. Blackwell and the hearing.

Thank you.

[The prepared statement of Senator Wallop follows:]

PREPARED STATEMENT OF SENATOR MALCOLM WALLOP

Mr. Chairman, I join you in welcoming our witnesses today. Concerns about the current health and long-term prospects for the U.S. industrial base have reached such a level that five major studies of the issue have been released within the last year. Each of these studies has made clear that growing worldwide economic interdependence presents defense policy makers with a serious set of challenges. Nothing less than our continuing ability to maintain deterrence is at stake.

After all the data is collected and the information sifted, the fundamental issue seems to be the appropriate role for the government and the agencies within it in coping with the challenges. As the various studies have made clear, the documented erosion of the domestic defense industrial base is the result of factors such as general trends in international trade; currency exchange rates; availability of investment capital; tax policies both here and abroad; and the attitude of private sector management, which are less susceptible to direct control than defense spending levels and legislated acquisition requirements.

Clearly more coordinated policy-making across all government agencies is warranted. Last year, this subcommittee helped lay the groundwork for that coordination with the sections in Chapter 148 of title 10 dealing with offset policy and the negotiation of procurement memoranda of understanding. There is also reason to proceed with caution. Austere defense budgets do not give us the option of throwing large amounts of money at this problem. Massive government intervention is an extremely poor substitute for an effective, competitive marketplace as a mechanism for growing internationally competitive industries. We cannot lose sight of the fact that over-regulation of the defense industry-government relationship has been cited as one of the primary causes of the erosion of the defense industrial base.

The analyses contained in the recent studies recognize these complex questions. We are fortunate today in having before us many of the individuals who helped draft those studies and who have contributed to our understanding of industrial base trends for many years. Their counsel will be essential as we navigate through the policy options we must consider.

Senator **Bingaman**. Jim, why don't you go ahead with your statement, and then we will both have some questions of you, I am sure.

STATEMENT OF JAMES A. BLACKWELL, DEPUTY DIRECTOR, POLITICAL-MILITARY STUDIES, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Dr. **Blackwell**. Thank you, Mr. Chairman.

After a year of studying these issues, I am convinced that the effort you have undertaken in this subcommittee is not only an important one, but one which I think will have an impact on the very foundation of our national security.

I am pleased to be here upon the release of our final report, and I want to provide just a few highlights of those findings and a summary of our recommendations. I will be happy to go into whatever detail the subcommittee would like on the more specific portions of that report. We have brought several copies for your use.

The first issue that faces the U.S. defense industrial base, and the point of greatest contention in our own deliberations, is the very definition of the base, as Mr. Donnelly stated, and the relationship between the U.S. industry and the national security.

The United States no longer relies on a strategy of industrial mobilization to preserve our security. We simply cannot afford to rely solely on the ability of our superior industrial capacity to protect our national interests around the globe.

Our potential adversaries are no longer deterred by the memory of the fact that between 1940 and 1945, for example, we produced 296,000 aircraft; 1,201 major naval vessels; 64,000 landing craft; 80,000 tanks; and 41.5 billion rounds of ammunition.

Our strategy of flexible response through ready strategic nuclear forces and robust, forward-deployed conventional forces, deters our adversaries today because those adversaries are convinced that we would use those forces if needed.

The contribution of the defense industrial base to deterrence thus lies not in our capacity for total industrial mobilization, which clearly is unmatched in the world, but rather in three fundamental capabilities that must be present right now in the defense industrial base. In our work in the project on the defense industrial base, we used these criteria against which to judge the effectiveness of that base.

One, peacetime efficiency. The defense industrial base must respond to the demands of our defense acquisition programs with cost-effective, reliable, and capable systems.

Two, technological competitiveness. The United States has opted to respond to the great quantity of threats to our security through maintaining a qualitative lead in technologically superior material.

And third, contingency flexibility. The base must retain some adaptability to convert from peacetime research, development, and production to that needed for anticipated future conflict requirements.

When we assessed the performance of the U.S. defense industrial base against this criteria, we concluded that deterrence is in decay. And when we examined the structure of that base, we concluded that the erosion is probably going to continue unless basic changes are made.

In conducting our research, we obtained data from a number of public sources which supported our findings but which also caused us to conclude that part of the problem is, as Mr. Donnelly pointed out, the lack of access to data in usable form for effective decision making, management, and legislation.

Much of the information we were able to assemble cannot be provided readily to the lawmakers and managers who need it because there is as yet no information processing system to do so.

Frankly, I was surprised to hear Mr. Donnelly say that DINET is on-line, because as we were conducting this study, we were briefed by DINET staff. We, in fact, had the opportunity to sit down and use the system, and throughout our study it was described as a pilot program at very low-level fundings, and the future of DINET was very much in doubt.

Now, we have not used the system in the last month or so as we have been drafting our final report, so it would be, indeed, pleasing to hear that they have found the funding for that program; but as we went to press, it was reported to us by the staff in the office of the Under Secretary that the funding for that program was very much in jeopardy. And prior to the latest round of revisions, in fact, had been zeroed for the future.

Now, the most striking aspect of the U.S. defense industrial base that we found was, of course, that it has shrunk dramatically in the 1980s. In 1982 there were over 118,000 firms that provided goods directly to the Department of Defense out of the 215 industrial sectors from which DOD makes nearly all its acquisitions. In 1987 that number had declined to less than 40,000 firms.

What makes this shrinkage more startling is the fact that at the same time the number of firms in the total U.S. manufacturing economy in those sectors was on the increase and that defense purchases in total dollars out of those sectors was increasing at record peacetime rates.

Now, in some cases the national security was placed in jeopardy by the threatened shutdown of small firms or small plants such as the 1988 closing of the Avtex fiber production plant, which is the sole source of certain materials for missiles. We all know, of course, that that situation required a government bailout of the firm.

And while the date we were able to collect has certain technical and statistical complexities that preclude it from being the sole basis for policy, the magnitude and direction of the trend indicate that there are potentially hundreds of other such cases waiting for the Congress and the executive branch to resolve.

In assessing performance, we used measures such as import penetration, profitability, and investment. We found that import penetration into the defense industrial base is growing at about the same rate as it is in manufacturing overall, but in some key sectors, particularly at the lower tiers of production, it is much worse.

The vulnerability because of this import penetration goes beyond the fact that key critical components might not be available from foreign sources in time of emergency. The U.S. defense industry itself has become the target of market expansion by our allies and technological theft by our military adversaries.

CSIS held a conference a couple of months ago in Brussels. Sir Raymond Lygo of British Aerospace remarked that part of their strategy as they march up to EC 1992 is to come after the market in the United States, not so much through erecting trade barriers to our penetration of their market, but to increase the energy and the strength of their own firms to be able to penetrate our defense markets.

In U.S. manufacturing as a whole, the ratio of capital spending to the value of goods shipped, in terms of the financial climate in the defense industrial base, was 3.8 percent in 1980 and 4.3 percent in 1985. But the defense sectors performed worse than U.S. manufacturing overall and, contrary to the rest of the industrial base, capital spending in defense-related sectors actually declined, falling from a sectoral average of 3.9 percent in 1980 to 3.6 percent in 1985.

In light of these statistics and many others, we judge the performance of the U.S. defense industrial base not to be good. And the reason lies in the very structure of the base. Two factors interact to drive the erosion of the U.S. defense industrial base: the organizational structure of the defense market sectors and the behavior of the customer in those markets.

Most sectors in which DOD does its business are highly competitive, commercially oriented markets, where DOD is not a particularly powerful customer, in terms of buyer leverage. Most defense-related industries, especially in the lower tiers where prime contracts are comparatively scarce, are commercially driven. Firms that succeed in these sectors must be lean and efficient.

But the behavior of the DOD in these markets does not promote efficiency. In fact, the U.S. defense acquisition system itself is a source of waste and inefficiency as a result of factors such as unnecessary or duplicative oversight, auditing, and regulations; program and budget instability and poor estimates; excessive performance requirements; and overspecification of product and process.

Many of these factors were identified by the Packard Commission and other efforts at reform in the past.

Estimates vary somewhat, but a previous CSIS study concluded that about 25 percent of total acquisition costs are wasted in this manner. Now, many accuse the defense industry itself of being often lazy, usually inefficient and sometimes criminal. But the defense acquisition systems has itself imposed an inefficiency premium, paid by the principal shareholders of the buying firm, the taxpayers, on doing business with this increasingly incorrigible customer representative, DOD.

Although the increasing integration and interdependence of the world's industrial base means that no nation can achieve pre-eminence in all critical defense manufacturing, these structural factors have produced a serious erosion of the defense industrial base of the United States in the 1990s.

If public policy does not reflect these factors, and where feasible change them or counteract their effects, the erosion will continue, as the demand for defense goods continues to decline in the foreseeable near future. This is why we concluded that deterrence is in decay.

Present U.S. policies are largely ineffective in dealing with these problems. The effective policies that do exist are haphazardly applied and underfunded. And some valuable programs have fallen prey to other defense priorities.

In many respects, the problems of the U.S. defense industrial base are leadership issues. The National Security Council must recognize this issue of leadership and reorganize its policy structure to reflect this understanding.

The Congress should streamline its procedures regarding defense industrial base oversight and budgeting. Too much law and policy are made based on parochial or bureaucratic interests using anecdotal or incomplete data.

Management at all levels lacks the information system needed just to understand the nature and extent of the problems of the defense industrial base.

In my judgment, we need to adopt new policies and reinvigorate old programs in three basic areas:

One, the defense acquisition system needs to be reformed to create more productive oversight of defense industries in peacetime to reduce the cost of doing business with DOD. This can be done without hampering the Government's ability and responsibility to root out and deter waste, fraud, and abuse.

Two, defense management must reflect more rational planning, programming, and budgeting in the context of the U.S. national security strategy.

And three, DOD should fund selective financial incentives for firms in industries that are particularly disadvantaged in globally competitive defense markets or for industries in which it is especially vital to have a domestic production base.

No new legislation is needed to adopt these policy initiatives. Authority exists in the annual Defense Authorization Act, the Defense Production Act, the Trade Act, and other laws to preserve the future of the U.S. defense industrial base. But the provisions of these laws need to be reviewed and updated and the programs they authorize need adequate funding and effective management.

In sum, the U.S. defense industrial base is in a state of decline. This malady is somewhat concealed by the overall health of the U.S. economy, but it is no less worse than when our economic robustness reflects more the strength of the service sectors than that of the manufacturing base.

As Robert Costello said when he was the Under Secretary for Acquisition, "You can't fight a war with pizza parlors."

The structure and the performance of the U.S. defense industrial base pose significant challenges to peacetime efficiency, technological competitiveness, and flexibility to meet future contingencies. These difficulties are the result of both global trends, which we do not control, and our policy response, which we do control.

I urge this subcommittee to take a view toward the defense industrial base which considers the challenges we face with deterrence in decay.

At CSIS, we will continue to work to achieve integrative, bipartisan solutions to this problem. And I have appreciated your time and will answer any questions you may have.

[The prepared statement of Dr. Blackwell follows. The CSIS report on the defense industrial base is retained in the committee files.]

TESTIMONY OF
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Mr. Chairman, members of the subcommittee, it is a privilege to speak here today to address issues confronting the U.S. defense industrial base. The effort this subcommittee has undertaken is an important one in preserving our national security for the future. Indeed, the very foundation of our national security may be at stake in the outcome of this process.

At the Center for Strategic and International Studies we have just completed a year-long study of the challenges confronting the U.S. defense industrial base. We have just published our final report, titled, "Deterrence in Decay," copies of which have been provided to the committee staff. Today I will provide a few highlights of our findings and a summary of the project's recommendations.

The first issue that faces the U.S. defense industrial base, and the point of greatest contention in our own deliberations, is the relationship between U.S. industry and the national security. The U.S. no longer relies on a strategy of industrial mobilization to preserve our security. We simply cannot afford to rely solely on the ability of our superior industrial capacity to protect our national interests around the globe. Our potential adversaries are no longer deterred by the memory of the fact that between 1940 and 1945 we produced 296,000 aircraft, 1,201 major naval vessels, 64,000 landing craft, 80,000 tanks and 41.5 billion rounds of ammunition. Our strategy of flexible response through ready strategic nuclear forces and robust forward deployed conventional forces deters our adversaries today because they are convinced that we would use those forces if needed.

The contribution of the defense industrial base to deterrence today thus lies not in our capacity for total industrial mobilization, which clearly is unmatched in the world, but in three fundamental capabilities that must be present right now in the defense industrial base:

1. PEACETIME EFFICIENCY - the defense industrial base must respond to the demands of our defense acquisition programs with cost-effective, reliable and capable systems.

2. TECHNOLOGICAL COMPETITIVENESS - the United States has opted to respond to the great quantity of threats to our security through maintaining a qualitative lead in technologically superior materiel; and

3. CONTINGENCY FLEXIBILITY - the base must retain some adaptability to convert from peacetime research, development and production to that needed for anticipated future conflict requirements.

When we assessed the performance of the U.S. defense industrial base against this criteria, we concluded that deterrence is in decay. When we examined the structure of the defense industrial base, we concluded that the erosion is probably going to continue unless basic changes are made.

In conducting our research, we obtained data from a number of public sources which supported our findings but which also caused us to conclude that part of the problem is the lack of access to data in usable form for effective decision making, management and legislation. Much of the information we were able to assemble cannot be provided readily to the lawmakers and managers who need it because there is no information processing system to do so. The first priority is to construct an architecture of advanced information processing hardware and data management software to identify where the critical industrial problems are and to monitor progress in efforts to correct them.

The most striking aspect of the U.S. defense industrial base is that it has shrunk dramatically in the s. In 1982 there were over 118,000 firms that provided goods directly to the Department of Defense out of the 215 industrial sectors from which DoD makes nearly all of its acquisitions. In 1987 that number had declined to less than 40,000 firms. What makes this shrinkage more startling is the fact that at the same time the number of firms in the total U.S. manufacturing economy in those sectors was on the increase and that defense purchases in total dollars out of those sectors was increasing at record peacetime rates. -

In some cases the national security was placed in jeopardy by the threatened shut-down of small production facilities such as the 1988 closing of the Avtex fibre production plant - the sole source of certain materials for missiles. We all know of course, that situation required a government bailout of the firm. While the data we were able to collect has certain technical and statistical complexities that preclude it from being the sole basis for policy, the magnitude and direction of the trend indicate that there are potentially hundreds of other such cases waiting for the Congress and the executive branch to resolve.

In assessing performance, we used measures such as import penetration, profitability, and investment. We found that import penetration into the defense industrial base is growing at about the same rate as it is in manufacturing overall but in some key sectors - particularly in the lower tiers of production - it is much worse. The vulnerability goes beyond the fact that key critical components might not be available from foreign sources in time of emergency. The U.S. defense industry itself has become the target of market expansion by our allies and technological theft by our military adversaries. There is little prospect for a turnaround soon considering the financial outlook in the defense industrial base.

In U.S. manufacturing as a whole, the ratio of capital spending to value of goods shipped was 3.8 percent in 1980 and 4.3 percent in 1985. The defense sectors performed worse than U.S. manufacturing overall and, contrary to the rest of the base, capital spending in defense sectors actually declined, falling from a sectoral average of 3.9 percent in 1980 to 3.6 percent in 1985.

In light of these statistics, the performance of the U.S. defense industrial base has not been good. The reason lies in the very structure of the base. Two factors interact to drive the erosion of the U.S. defense industrial base: the organizational structure of the defense sectors and the behavior of the customer in those markets.

Most sectors in which DoD does its business are highly competitive, commercially oriented markets where DoD is not a particularly powerful customer, in terms of buyer leverage. Most defense-related industries -- especially in the lower tiers where prime contracts are relatively scarce -- are commercially driven. Firms that succeed in these sectors must be lean and efficient.

But the behavior of the DoD as a customer in these markets does not promote efficiency. In fact the U.S. defense acquisition system is itself a source of waste and inefficiency as a result of unnecessary or duplicative oversight, auditing and regulations; program and budget instability and poor estimates; excessive performance requirements; and overspeculation of product and process. Estimates vary somewhat, but a previous

CSIS study concluded that about 25 percent of total acquisition costs are wasted in this manner. Many accuse the defense industry of being often lazy, usually inefficient and sometimes criminal. But the defense acquisition system has itself imposed an inefficiency premium - paid by the principal shareholders of the buying firm, the taxpayers - on doing business with this increasingly incorrigible customer representative - DoD.

Although the increasing integration and interdependence of the world's industrial base mean that no nation can achieve autarky in all critical defense manufacturing, these structural factors have produced a serious erosion of the defense industrial base in the 1980s. If public policy does not reflect these factors, and where feasible change them or counteract their effects, the erosion will continue as the demand for defense goods continues to decline in the foreseeable near future. This is why we conclude that deterrence is in decay.

Present U.S. policies are largely ineffective in dealing with these problems. The effective policies that do exist are haphazardly applied and underfunded. Some valuable programs have fallen prey to other defense priorities.

In many respects, the problems of the U.S. defense industrial base are leadership issues. The National Security Council must recognize this issue of leadership and reorganize its policy structure to reflect this understanding. The Congress must streamline its procedures regarding defense industrial base oversight and budgeting. Too much law and policy are made based on parochial or bureaucratic interests using anecdotal or incomplete data. Management at all levels lacks the information system needed just to understand the nature and extent of the problems of the defense industrial base.

We need to adopt new policies and reinvigorate old programs in three basic areas:

1. The defense acquisition system needs to be reformed to create more productive oversight of defense industries in peacetime to reduce the cost of doing business with DoD. This can be done without hampering the government's ability and responsibility to root out and deter waste, fraud and abuse;

2. Defense management must reflect more rational planning, programming and budgeting in the context of U.S. national security strategy; and

3. DoD should fund selective financial incentives for firms in industries that are particularly disadvantaged in globally competitive defense markets or for industries in which it is especially vital to have a domestic production base.

No new legislation is needed to adopt these policy initiatives. Authority exists in the annual Defense Authorization Act, the Defense Production Act, the Trade Act and other laws to preserve the future of the U.S. defense industrial base. The provisions of these laws need to be reviewed and updated and the programs they authorize need adequate funding and effective management.

In sum, the U.S. defense industrial base is in a state of decline. This malady is somewhat concealed by the overall health of the U.S. economy, but it is no less worrisome when our economic robustness reflects more the strength of the service sectors than that of the manufacturing base. As Robert Costello said when he was the under secretary of defense for acquisition, "You can't fight a war with pizza parlors."

The structure and the performance of the U.S. defense industrial base pose significant challenges to peacetime efficiency, technological competitiveness, and flexibility to meet future contingencies. These difficulties are the result of both global trends which we do not control and our policy response which we do control. I urge this subcommittee to take a view toward the defense industrial base which considers the challenges we face with deterrence in decay. At CSIS, we will continue to work to achieve integrative, bipartisan solutions to this problem. I have appreciated your time and will answer any questions you may have.

Senator BINGAMAN. Thank you very much.

I will start here and ask a few questions, then defer to Senator Wallop.

DINET FUNDING

Mr. Donnelly, your point that we are finding out how little we actually know about this issue of the defense industrial base, is, I think, accurate. I have been concerned about the point that Jim made there about the funding level for DINET. My information is consistent with his, and that is that DOD proposed to zero out funding to maintain the DINET program. It does not seem like that demonstrates a strong commitment in that area.

What is your understanding of whether or not we are going to have any funds to continue with this effort?

Mr. DONNELLY. My statement may not be totally congruent with Jim's in that area. We do have the pilot program up and running; and I ran the sausage machine last week and watched it spit out information. But if I gave the wrong impression that it is a full-up, operating system, I did not want to do that. It is not full up; it is not totally operational. It is not being used throughout the Department yet. It should be used throughout the Department. It is not to be a data base that the Office of the Secretary of Defense will use; it should be a data base that the Department of Defense should use.

With respect to the funding, I am going to be briefed this week and will have a better idea of where our staff wants to spend the dollars should they become available. I am not satisfied with the numbers I have seen, the first cut of the numbers, of what that system will cost. And I want to get the numbers down, to some extent.

Senator BINGAMAN. But you do not have a clear figure now in your mind as to what has been requested for 1990, or what is expected to be spent in the next fiscal year?

Mr. DONNELLY. No, I do not. But I can provide further information to you.

Senator BINGAMAN. I think that would be very useful before we get to our markup.

[The information follows:]

DINET FUNDING

At this time I do not have a firm figure as to the estimated cost to develop the Defense Industrial Network (DINET). An action plan is currently being completed by the Office of the Secretary of Defense. It identifies 17 technical tasks that are required to address 28 fundamental questions concerning our manufacturing base. This action plan has not been approved yet, however, it is receiving our highest priority attention. Because data base development is complex, we are proceeding at a cautious pace to ensure that we use our limited resources efficiently. Also, we want to be reasonably assured that DINET provides a clear application to defense needs. During fiscal year 1989, we estimate that approximately $500,000 will be spent to improve our visibility of critical subtier industries. For the first time definitive studies of the manufacturing base will be developed and placed in a relational data base format; which will provide us greater access to timely information on manufacturing issues. Relational data bases increase the range of data that can be analyzed and will decrease the processing time required to prepare accurate assessments. This in turn will enable us to identify the significance of specific products, weapon systems, and suppliers. The issue of long term DINET funding will be raised in the next cycle of the DOD Programming, Planning, and Budgeting System. We have also nominated DINET to the Assistant Secretary of Defense, Comptroller for MAISRC review; and are now engaged in a dialogue to answer technical questions regarding development. The DINET program holds great promise and continues to be one of our highest priority efforts.

SOCRATES PROGRAM

Senator BINGAMAN. In the Socrates Program that you referred to; I do not know if you have any information now about the funding level, but my information again is that it is woefully inadequate.

Mr. DONNELLY. That may be true also. It seems to me that we have the capability to look at about—do not hold me to the numbers exactly—maybe 250 different technologies through Socrates today, and we would like to expand that something like tenfold.

Socrates operates on a skeleton basis today; and it does need to be filled out and improved.

MANTECH

Senator BINGAMAN. Let me ask about ManTech. You referred to the ManTech Program and the IMIP Program. We have tried to support those in this subcommittee in recent years. Again, I am doubtful about the commitment on the part of the administration, because every time we receive a budget it demonstrates a significant cut in ManTech funding.

The Air Force, which I understand is the main service that has tried to pursue this program, and has done so with some success and deserves some credit for that, has been slated for a $25 million cut in 1990 in their ManTech budget.

I understand it is comparable in the IMIP Program. Do you have information for us today that would contradict any of that information?

Mr. DONNELLY. I do not have the exact numbers with me, Mr. Chairman. I can tell you that ManTech and IMIP, and a number of other programs that I watch over, have taken cuts, along with, obviously, weapon systems and equipment. It is difficult to sustain these kinds of programs simply because while they are very important, they are not, in themselves, a major weapon system with a large constituency. So it is necessary for us to keep drawing attention to the programs and to the ROI that comes from them.

In the case of ManTech and perhaps in the case of IMIP, we are not particularly satisfied at the OSD level that the services have implemented those programs to the degree that would be most useful.

The Air Force, as you point out, sir, has done a magnificent job in the program, and they are in a leadership role in that. I cannot make that same statement for Navy and Army at this point.

But I cannot give you an answer, as far as whether that program should have increased dollars or not. The President's budget is prepared with a lot of tradeoffs.

Senator BINGAMAN. I think the problem which you alluded to is at least a couple of fold. One, is that if there is a payoff in these, it is a long-term payoff and therefore you cannot see it immediately by putting money in this year's budget.

The other thing is there is no large constituency out there, or there is no industrial constituency that has an interest in seeing that program funding as such, as you have in the case of a weapon system.

Mr. DONNELLY. Yes, sir. It is not that industry disagrees with the program, it is just not something that makes the front page.

Senator BINGAMAN. It is not a priority.

Mr. DONNELLY. Yes. It is not that obvious. But when you look back over the horizon of that program and you find out that much of the spinoffs of ManTech have literally improved the overall U.S. industrial infrastructure, you become more interested; like robotics, computer-aided design, computer-aided manufacturing, near-net shape forging.

A lot of these kinds of things that we did to reduce the cost and improve productivity of weapon systems, literally did spin off into the U.S. marketplace. It is a very valuable program in that context.

It is interesting, I think Mr. Murrin talks about this as well, that we talk spin off into the marketplace, and the Japanese use the term spin on. When you think about that, it is an interesting difference.

Senator BINGAMAN. My time has run out. Let me call on Senator Wallop.

Senator WALLOP. Mr. Chairman, thank you.

Dr. Blackwell, when you were going through your statement you made the observation that capital spending in defense-related industry was down, vis-a-vis capital spending in American industry generally. May I ask you how much of that is due to the uncertainty in the defense marketplace versus a pretty robust economy in the conventional marketplace?

Dr. BLACKWELL. Senator, I cannot give you a definitive answer based on the data we collected. It is not collected from the investment analysts who invest in various firms, it is not collected from the capital spenders in defense firms, it is an observation of how much is in fact being spent.

But I would venture to reflect my own opinion as to how much of it is reflective of an adversity to defense investment by the firms and the investors. I have been at several meetings with defense corporations, their senior staff. TRW Corporation, for one, hosted a meeting yesterday with their investors. And they invited me to speak on the future of the world conflict environment.

They are very much adverse to investing in defense industries and in any firm that is heavily reliant on those sectors of defense which are not recognized generally as going to at least maintain a steady spending level.

Your can find investors who will pick winners in aerospace, perhaps in electronics, and who might even venture a little risk capital in some esoteric technologies. But one automotive industry analyst last night said, "Why should I be pouring my money into TRW when defense is going to make it worse before it gets better?" And I think that is generally reflective of the attitude out there among industry analysts and investors in the defense area.

I would characterize that though as my own personal opinion based on the interaction I have had with those people rather than a statistical average.

Senator WALLOP. Well, in fact, there would probably be no such thing as a statistical average——

Dr. BLACKWELL. That is correct. It does not exist.

Senator WALLOP [continuing]. As to why people directed capital. But analysts, still, are those who recommend to their clients where investment capital should go. And one of the problems, which I think you also mentioned in your remarks, was that defense was more and more an incorrigible place with which to do business.

Dr. BLACKWELL. Yes, indeed.

Senator WALLOP. But at the end of your CSIS study, and you went through a few of them, a large number of recommendations for arresting the erosion of the defense industrial base; most of those within the purview of the Department of Defense do not need legislative direction.

If we did everything that the study recommends, would the problem go away?

Dr. BLACKWELL. I am sorry, Senator, would you repeat the question?

Senator WALLOP. If we did everything that you recommend, would the problem go away?

Dr. BLACKWELL. As I pointed out, many of the problems are structural. And the things that the Government, in general, and the DOD in particular, can do are driven by things that are happening in the global economy and things that are happening in the U.S. economy. I think the short answer is: no, it will not completely go away if we did everything that we recommend that you do. But the Government would have the tools to provide an optimum response to things that are happening around the DOD budget. Right now we do not even have those tools.

I would have to agree with Mr. Donnelly, that the only way you can solve all the problems that we identify is to restore the competitiveness of U.S. industry as a whole. And I believe that is far beyond the control of the Defense Department alone. I would advocate that they have a very strong voice and very influential role in those policies, but with less than 6 percent of U.S. GNP, the defense spending itself is not going to be able to restore competitiveness to U.S. manufacturing industries.

Senator **Wallop**. That is one of the interesting aspects come from the Finance Committee to the Armed Services Committee. Last year's political buzz word was competitiveness, but precious few people ever paid anything more than lip service to it, especially when it came to imposing taxes or mandated work place requirements and other things that other industries in other countries do not have. Especially if you put those mandated requirements in the circle of competition that includes government subsidies from other countries, the global interdependence problem seems much more intractable than just the administrative problems.

Which brings me to a question: Do we not risk throwing a lot of DOD money into a sort of DOD keyhole trying to solve a problem that has far broader consequences?

Dr. **Blackwell**. Our recommendations on selective incentives, Senator, are directed at what we call critical sectors, and we called them strategically targeted critical sectors. We did not envision spending hundreds of billions trying to pick winners and losers. Frankly, as we have pointed out, we would lack the ability to make those kinds of choices.

We ought to invest in an architecture of a management analysis information system so we can find out which critical sectors are most important to the national security, which ones where there would be a reasonable expectation of a return on an investment, and DOD ought to be out in front in providing those incentives that the market right now does not provide.

That is why we very carefully defined the relationship between national security and the industrial base. If you do not limit that, then you very quickly, end up trying to use the defense budget for national industrial policy.

Senator **Wallop**. Thank you, Mr. Chairman. My time is up.

Senator **Bingaman**. Let me ask a few more questions and then we will have another round here.

Mr. Donnelly, let me ask for your comments on a couple of recommendations that were made in our hearing yesterday. Professor Louis Branscomb, who has been interested in these issues for a long time and has worked on them, made several good recommendations. And some of them seem to me to fall somewhat within your jurisdiction.

MILSPEC STANDARDS

He said that one thing that needs to be done is a review of the full range of MILSPEC standards to seek maximum compatibility with commercial engineering standards. Is that something that is being done?

Mr. **Donnelly**. Yes, sir. Mr. Chairman, I use, in the lectures we give down at the Defense Systems Management College, something I saw in a MILSPEC a few years ago. It says, "Deck houses shall be made of steel." I think that is an analogy here—that the Defense

Department's specifications and standards should not specify how to build it and what it is to be made of, it should specify what we want it to do.

In the case of a deck house, which I presume is up in the superstructure of a ship, we should be saying deck houses should be able to withstand an over pressure of X, or other qualitative ways. Rather than tell industry how to build something, let us tell industry what we need.

To the extent we can also use commercially available specifications and standards, we should do that as well.

We do have a program, I forget the acronym, but it is something like CCAP, the Commercial Commodity Acquisition Program, where we are attempting to switch over to industry standards wherever possible.

Of course, sometimes the things we buy are so far out on the leading edge that we must have our own specifications and standards, but there is much more room for improvement in converting to commercial standards.

Senator BINGAMAN. But now this CCAP, is that the name of it?

Mr. DONNELLY. I might be wrong, it is something close to that, sir.

Senator BINGAMAN. It is the group primarily doing the review of the MILSPECs to bring them into line with——

Mr. DONNELLY. Yes, sir. And to get rid of the specifications where we can.

Senator BINGAMAN. And that is where it is happening within DOD?

Mr. DONNELLY. Yes, sir.

Senator BINGAMAN. How many people are involved in that?

Mr. DONNELLY. They do not come under my network. I would have to get back to you for the record on that.

Senator BINGAMAN. I wish you would get us information on the extent of that effort that is going forward.

Mr. DONNELLY. Yes, sir. I would be glad to. If you had to pick the top four, five, six things that we can be doing that can have a big effect, that certainly is one of them. It is a good idea, and we need to continue with it.

[The information follows:]

DOD SPECIFICATIONS AND STANDARDS

In a memorandum dated January 10, 1989, USD(A) requested the Services and DLA to review all specifications and standards in 400 supply classes which were identified, in Appendix B of "Enhancing Defense Standardization," as having commercial potential. This review requested a description of actions to be taken, including milestones, to replace military specifications for commercial products and processes with either non-Government standards, commercial item descriptions, federal specification or standards, or an alternative procurement approach, such as a multiple award schedule. During this review, which is scheduled for completion in July 1989, the number of personnel involved is estimated conservatively to be in the upper hundreds. A copy of the report "Enhancing Defense Standardization" is attached.

[The report "Enhancing Defense Standardization" is retained in the committee files.]

MANUFACTURABILITY

Senator BINGAMAN. Another recommendation of Professor Branscomb is one that I am going to ask some of our other witnesses today about: Is ensuring that manufacturability is a central feature of systems design, if necessary, by removing the 1986 Procurement Act requirement to separate contract competitions for R&D from production, something that the DOD supports?

Mr. DONNELLY. I cannot answer that in total. I would have to read that 1986 act. Does he mean the Competition in Contracting Act?

Senator BINGAMAN. Yes, he does.

Mr. DONNELLY. Yes, he does? I saw shaking of heads saying no, he does not.

Senator BINGAMAN. I thought he did.

Mr. DONNELLY. Let me try to get back with a more comprehensive answer to that. But the idea of building in manufacturability or producability into our procurement strategies is right on track. One of the mistakes we sometimes make is not allowing the manufacturing R&D to keep pace with the product R&D.

MANTECH PROGRAM

To take us back to the ManTech program we were talking about earlier, one of the tactical errors I think we might have made in 1980–81 when we began the build-up was that we assumed that while we were making investments in product R&D, weapons to go faster, higher, deeper, and so forth, we just assumed that the manufacturing R&D investments would be made automatically. And that was not necessarily the case.

So in the future with new starts, what we need to do is assure that the manufacturing, or process R&D, keeps pace with the product R&D, and then we will be better off.

Senator BINGAMAN. The Defense Science Board recently did a study on the use of commercial developments in defense programs. We have been asking to see a copy of that, and we are advised that it will not be available until Secretary Cheney has had a chance to see it. Do you know when we might hope to see that? We are hoping that we do not miss the opportunity to do something about some of the recommendations in there if they require any action by the Congress. Do you have any sense as to when that might happen?

Mr. DONNELLY. No, sir. But I was wondering what I could do this afternoon; I will go back and find out when that will be available.

Senator BINGAMAN. That would be great. We would appreciate that.

Mr. DONNELLY. I understand the message.

[The committee subsequently received the report which is retained in committee files.]

FOREIGN R&D FUNDED RESEARCH

Senator BINGAMAN. Let me ask one other question here. Do you think it is appropriate for foreign firms to be eligible to do R&D work on contract to DARPA in an area like HDTV? I understand Sony and perhaps some European firms have applied to do some of that R&D work that DARPA intends to fund; while at the same time, as I understand it, U.S. firms are almost always excluded—perhaps always excluded—from any foreign R&D-funded research.

One example is that IBM would not be eligible, as I understand it, to pursue research in this European computer project, JESSI. Do you have any position on that?

Mr. DONNELLY. I can talk a little about it, Mr. Chairman. I am basically a logistician in an R&D community, so I will have to talk from that perspective.

When we permit our allies to jointly do R&D with us, often, if we do it right and smart, we will be able to capture technologies that might not be available to us otherwise. But the downside of that, of course, as you point out, is where are the opportunities for U.S. industry in the foreign R&D markets? I guess that was one reason I mentioned the dumping earlier, which is a little different issue, but I think we should be taking advantage of the authorities and remedies we have in the trade arena to allow more access of U.S. companies overseas. There truly is a globalization going on, and there are grand opportunities. We all need to learn how to live within that, industry as well as government.

Foreign investment and foreign involvement in our acquisitions is something that is going to be with us, but it is something we need to do smartly. There are a couple of groups already looking at it to help us get smart. The Defense Policy Advisory Committee on Trade, DPACT, that Mr. Augustine chairs—and I believe he will be addressing that to some extent in his testimony—is helping us. The Defense Manufacturing Board is taking a piece of the foreign investment picture as it relates to manufacturing, and they are going to bring that up for us as well to help us have a better strategy on how to deal with these things. I cannot comment on HDTV specifically.

Senator BINGAMAN. OK.

Senator Wallop.

Senator WALLOP. Thank you, Mr. Chairman.

One of the things that an observer of the process is struck by is how many officers there are amongst the services in the procurement process. It would seem that that is a storage place for people between combat assignments. And they are good people. I am not disparaging them. But the problem that we have is the very fact that they are good. And they sit there with less than a full day's work and a conscience. And it brings you to this massively changing set of requirements that are both frustrating to the industry and costly to the taxpayer, and puts DOD into the position that Dr. Blackwell describes: an increasingly incorrigible climate.

Is there any sense as to how we deal with that number—I think it was mentioned in Secretary Lehman's book as a problem that they have identified in the Navy?

Mr. DONNELLY. I am getting off into some of my own personal views, and not necessarily the Department. We have been looking at ways to do more centralization of the requirements, generation process, and the procurement process. We have a very large structure, as you point out, and it is capable of some improvement.

But I think you would hurt the feelings of a lot of those people when you say that they have a lot of time on their hands and they are coming up with these ideas. Most of them whom I know are very busy and very objective in what they are trying to get done.

But there is room for improvement on the acquisition structure.

Senator WALLOP. Please understand, I was not criticizing them; I was criticizing the process. I know they are busy; part of the busyness is self-generated.

Mr. DONNELLY. And part of their business is that every time I ask a question they have to have somebody—and that is multiplied by four, because they are four services—answer something.

Senator WALLOP. And Congress has a certain small role in that, too.

Mr. DONNELLY. There is a role there. I am glad you pointed that out and not me.

But on the requirements issue I think most people would agree that, to the extent we can stabilize the requirement of what we want, when we want it, and stay with that for 3 or 4 years, that would be the absolute number one thing to help improve the competitiveness of the defense-related industry.

When we, either through our fault or through the legislative branch's fault, jerk around the production rates of weapon systems, it just does not work for permitting industry to make the investments they need to make in new manufacturing equipment, for example. I mean, how can any of us, if we were a company official, go to the bank and say: I want to borrow this money for a new five axis milling machine, when you just do not know whether you are going to be able to sell your product next year or not? That is a serious problem.

Senator WALLOP. And being expensive in the product end as well. Because once you finally do that you are going to have to make certain that your first year's production takes care of your manufacturing investment, otherwise you cannot go to the bank.

Mr. DONNELLY. That is correct, sir.

Senator WALLOP. I think that goes back to Jim's response to my other question.

Now, as we look down through the variety of programs and studies that exist in the Department of Defense for improving this, and I will not go through all their names, although some of them have been mentioned this morning. I have a few questions. Question one: Are there too many? Question two: Is there any effort to coordinate them? And three: In that effort of coordination, is there any sense that redundancy exists and it is expensive, not so much in terms of the dollars spent on the program, but the energy wasted in trying to do the same thing?

Mr. DONNELLY. If you mean the programs, meaning the tools to fix the problem primarily, no, I do not believe there are too many; yes, I believe that there is room for improvement in the coordination among those tools and which ones you apply and when you apply them.

But the tools are for different purposes. For example, the ManTech, manufacturing technology, is a tool that is targeted towards a generic manufacturing technology, like some type of a forging technology that would be applicable to a whole family of weapons or equipment.

The Industrial Modernization Incentives Program is not keyed in on a technology as much as it is keyed in on an individual facility or a group of plants to improve their productivity.

I guess I should also point out, that sometimes these tools that we have, and just the fact that we are proceeding in getting ready to spend money on an issue, often makes the problem go away, and we do not have to spend the money. An example is our authority under the Defense Production Act, where we can create new capacity and we can go out into the marketplace and, say, put an assured market out for a product.

Once we say that we are going to provide an assured market for the product, the investments take place and we do not have to spend a nickel. So a lot of these things are direct on-budget programs, and the others are subtleties on how you manage them.

But I am not satisfied, like I said earlier, that all these things are linked together as well as they should be. That is one of our major efforts for the rest of this year, to work on a system to link them better.

Let me mention one more thing. When you look at it on a continuum and from a resource standpoint and you see, perhaps, that we have a 4-year stock of a strategic material, and then on the other end of the spectrum we have 30 days of combat sustainability in a weapon system, there is a need to more closely look at how we allocate our dollars among these programs to get the most out of them.

Senator WALLOP. Mr. Chairman, my time has expired, but I have one follow-up question, and it will be the last one that I would ask because it relates to all of this.

In the process of identifying problems, and even solutions to them, does the Department of Defense coordinate its recommendations, for example, with Treasury, and its recommendations in tax policy with Commerce's recommendations of the applications of trade laws and other things? It seems to me that if this was an entirely sort of narcissistic process, where you only look at yourself, we would waste an opportunity to try to tell Treasury that the defense industrial base has serious problems because of this kind of tax treatment.

Mr. DONNELLY. Let me tell a quick war story on that. When we were working on Dr. Costello's Bolstering Industrial Competitiveness Initiative, we got together with the civilian agencies on some of the issues. And we started a discussion about manufacturing and how it was eroding in the country today. One of the representatives from the civilian agencies, who later turned out to be one of our strongest allies, basically was saying, "What do you mean? Manufacturing is the same percent of the GNP today as it was last year, as it was 5 years ago. I mean, what is the issue? There is no problem."

And as we begin to peel back the onion on that and he became aware of some of the sectoral problems we had, he basically said, "Where were you when we were formulating the tax policy last year?"

So there is a synergism developing here. We need to do more of it. We need to find ways among the cooperation with the civilian agencies to get more national defense impact information cranked into economic policymaking in this country. We want to be part of that. It is not our job to do economic policymaking, but we want to be able to provide more impact information on it.

Certainly the situation with the Department of Commerce is changing, and that is for the better. We see more cooperation among those two agencies as well. So we are moving on the right track I think.

Senator WALLOP. Thank you.

Senator BINGAMAN. Well, I thank both of you for your testimony. We have a second panel, so we may submit some additional questions to either or both of you for a response to put in our record if we could. Thank you very much.

Our second panel includes Mr. Robert Fuhrman, who is the vice chairman of the board and chief operating officer for Lockheed Corp.; Mr. Norm Augustine, who is the chairman and CEO of Martin-Marietta Corp.; and Professor Tom Murrin, now the distinguished service professor of Technology and Management at Carnegie-Mellon University. Professor Murrin was, as many of you know, formerly an official with Westinghouse.

Let me give a very short introduction as to the activities that each of these gentlemen are involved in, just to indicate the expertise they have in this area. The 1988 Defense Science Board Summer Study on the Defense Industrial Technology Base includes a number of specific findings and recommendations related to improving our Nation's technology and industrial base. The report, issued in October of last year, notes that a significant difference exists between industry's capability and the tasks that national security plans assume it can perform. The task force makes 10 major recommendations in order to reverse the situation. Mr. Robert Fuhrman chaired that study, and is with us today to give his recommendations.

One of the initiatives recommended by the Bolstering Industrial Competitiveness Report, that was earlier referred to, was the establishment of a Defense Manufacturing Board, modeled on the Defense Science Board, to provide industry with a non-adversarial means of communicating with DOD's senior policymakers.

The first chairman of the Defense Manufacturing Board is Professor Tom Murrin. We have asked Professor Murrin to join us to provide a report on the Board's progress and plans and his recommendations on what the Congress needs to do to try to help enhance the Nation's industrial preparedness.

And finally, the issue of foreign dependency is an integral part of any assessment of the defense industrial base and our Nation's ability to compete. The Defense Policy Advisory Committee on Trade is charged with providing general policy advice on defense trade issues and domestic industrial base issues. Mr. Norm Augustine is the chairman of the DPACT, and we welcome his testimony on that important issue.

Why don't we start with Mr. Fuhrman, and then go to Mr. Murrin, and then Mr. Augustine.

Thank you for being here.

STATEMENT OF ROBERT A. FUHRMAN, PRESIDENT, LOCKHEED CORP.

Mr. FUHRMAN. Thank you, Mr. Chairman.

I submitted a formal statement on the issue. And I would like to give a rather abbreviated version of that.

Senator BINGAMAN. That is fine.

Mr. FUHRMAN. My name is Robert A. Fuhrman, I am vice chairman of the board and chief operating officer of Lockheed Corporation. I am appearing before you today, however, as chairman of last year's Defense Science Board Summer Study on the Defense Industrial and Technology Base.

And I would also mention, I am also vice chairman of the Defense Advisory Panel on Government/Industry Relations, which was created as a result of section 808 of the 1989 Defense Authorization Act, where we are trying to deal with some of these government/industry relationships; which I think are closely related to what we are talking about here.

I am personally greatly encouraged by the attention being devoted to the many complex issues for the defense industrial and technology base by this subcommittee, and, indeed, the entire Committee on Armed Services.

By establishing this subcommittee 2 years ago, I feel Chairman Nunn reflected the growing national concern over our loss of leadership in many key technologies. And during this Congress, I feel you will have some opportunities to help, perhaps, augment the situation.

Our principal national security strategy, as I think some have said before me, is that of deterrence. We have chosen not to match our adversaries, soldier for soldier and bullet for bullet. Instead, we have chosen to maintain a degree of technological superiority sufficient to overcome our numerical disadvantages.

The effectiveness of that deterrent, though, depends on our ability to maintain this technological superiority and in our adversary's belief in that ability. When our ability is questioned, the credibility of our deterrent is diminished, and I think the threat of war increases. And this, I think, is really what the concept of competitive strategy is all about; and my friend and colleague here, Norm Augustine, is working on a study related to that.

In late 1987, then-Secretary of Defense, Frank Carlucci, asked the Defense Science Board, the DSB, that is, to study the effects of the many global economic, technological and political changes which occurred in the 8 years since the last DSB study of the problem, which was in 1980.

Mr. Carlucci emphasized his concerns about the apparent diminution of America's technological superiority and the erosion of our industrial and technology base. In my further conversations with him, he expressed a clear desire to create a strong foundation for long-term solutions to these pressing problems.

Our study was tasked to recommend that foundation to him.

Now, to accomplish this study, we assembled a group of 28 leaders in the defense, financial, and academic communities.

I would like to mention that four of these had no prior ties to the defense industry or the industrial base as we think of it. We got people from the financial community to look at the industry as the way Wall Street might look at us.

We were supported by eight Government advisors drawn from the staff of this committee, its House counterpart, the Committee on Small Business, and the DOD. And to mention just a few people, Mr. Augustine, Mr. Donnelly, and Mr. Montalto, who are here today, were part of this study.

We organized ourselves into seven subgroups to deal with sets of issues, such as the globalization of the defense industrial base, the technology issue itself, and several others. Our final report represents the work of those subgroups, analyzed and refined by the entire group, and presented to the Secretary.

I request that our full report be included in the record of the hearing.

Senator BINGAMAN. We will include it all in the record.

Mr. FUHRMAN. Good; thank you.

[The report referred to is retained in the committee files.]

Mr. FUHRMAN. We reached the following principal findings, and I am just going to try to mention these briefly.

First, the continued deterioration of our industrial and technology base diminishes the credibility of our deterrent. It is, however, a national problem, not just a DOD problem, and it is going to require a coordinated response by DOD, Congress, and industry.

Second, current acquisition policies do not adequately recognize this irreversible globalization of the defense market and our dependence on foreign sources.

Third, a pattern of inadequate long-term investment by prime and subcontractors is a primary cause of the deterioration of the base.

And I could ad lib here that access to capital markets, as Senator Wallop was alluding to earlier, was found to be one of the primary problems here. The price/earning ratios of what we normally consider the defense industry was at its lowest point in 25 years. That was determined by our financial advisors.

The performance and capabilities of our base is directly affected by changes in tax, trade, environmental, and socio-economic policies, and these are interlinked. And, again, there is not always recognition of this.

The maritime industries, in particular, have deteriorated to the point where they cannot support national security objectives.

DOD acquisition policies cause some members of the subcontractor and supplier community to actually refuse DOD business or completely segregate that business from their commercial activities. And I think that was a point Mr. Blackwell made earlier.

And then the DOD technology base program lacks central management and suffers from instability of the technical work force in critical R&D centers. This significantly reduces its effectiveness.

Well, to help remedy the problems behind these findings, we recommend the following:

First, that the Secretary of Defense ask the President to form, by Executive order or other directive, a Cabinet-level industrial policy committee, chaired by the National Security Advisor, and chartered to compare the tasks, which national security plans assume industry can perform, with its actual capabilities, and to recommend specific resource, regulatory, and if necessary, legislative initiatives, to resolve the differences.

Second, to integrate surge planning, which we think is important as against full mobilization, into the POM and the POM processes, to account for the realities of the threat and the dependency that we now have on foreign sources; and then to move forward on the Joint Chiefs' Joint Industrial Mobilization Planning Program, called JIMPP, which tries to tie together mobilization, in the sense of surge, with the industrial base. And further, to purchase an 18-month buffer stock of critical foreign-sourced items—remember that I said earlier that we were critically dependent on certain foreign sources. We could purchase 18 months buffer stock, and that would protect us against certain kinds of contingencies.

And then we should conduct surge exercises regularly; again, to demonstrate deterrence.

We should move appropriate R&D centers to private operation. We are not saying all of them, but we think we could use the example of the federally-funded R&D centers that have been demonstrated in other areas. For example, Aerospace, MITRE, some of those. This would allow competitive salaries and benefits that would stabilize and maintain the high-quality engineering and scientific work force that is absolutely essential to the successful management and the execution of our national R&D effort.

We should conform the services' acquisition policies and strategies to a single DOD system, and impose specific objectives for maintaining industrial and technology base needs. And as an ancillary to that, we support completely the idea that ManTech and IMIP deserve additional support here; and do it from an overall OSD standpoint.

We should establish the capability to perform standard financial impact analyses of current and proposed acquisition policies, and craft incentive systems to truly encourage long-term investment in new technology, improved production processes and modern facilities. In doing this, we can help get stability into the system.

We should base competition not on price alone, as the CICA actually allows, but on total product quality. Companies' past performance and the maintainability and operability of the systems offered should be considered in this.

We should develop the means of matching our maritime capabilities, including those of our allies, with national security objectives.

We should reaffirm the importance of the independent research and development function to the technology base, determine IR&D ceilings in the context of long-term assessment of technology requirements, while maintaining the present method of cost recovery.

The message here, is we have to get some of our thinking long-term rather than short-term. I should have said more about that sooner perhaps.

We think we should convene a joint industry-DOD working group to consider further limitation on the use of the best and final offers. We think this is one of the causes of the problems coming to light in the Ill Wind investigation that we have heard about.

And further, that we should ensure that all defense contractors, suppliers, and consultants adopt and adhere to suitable codes of ethics to govern their business operations. And this would be a way to improve the public perception of the procurement system.

Now, Mr. Chairman, this is going to require some tough decisions. We recognize, in a level or declining budget situation, you cannot do all the things we mention here and maintain force structure and some of the other things. So we recognize tough, tough decisions have to be made. But we think we must get on some long-term approaches to the problem and get away from some of the short-term.

I am not sure that all of these recommendations would solve all the problems either, but I think they would get us on the road to doing it.

I thank you.

[The prepared statement of Mr. Fuhrman follows:]

TESTIMONY OF
ROBERT A. FUHRMAN
CHAIRMAN
DEFENSE SCIENCE BOARD TASK FORCE ON THE DEFENSE INDUSTRIAL AND TECHNOLOGY BASE

Mr. Chairman and members of the Subcommittee my name is Robert A. Fuhrman. I am Vice Chairman and Chief Operating Officer of the Lockheed Corporation. I am appearing before you today as Chairman of last years, Defense Science Board Study on the Defense Industrial and Technology Base.

I am greatly encouraged by the attention being devoted to the issues of the Defense Industrial and Technology Base by this Subcommittee and, indeed, the entire Committee on Armed Services. By establishing the Subcommittee two years ago, Chairman Nunn was reflecting not only his own concerns but yours as well and those of many in industry and the Defense Department. During this Congress, there will be several opportunities for you to assist industry and the Executive Branch in resolving these many issues.

Background

Our principal national security strategy is that of deterrence. We have chosen not to match our adversaries soldier for soldier and bullet for bullet. Instead, we have chosen to maintain a degree of technological superiority sufficient to overcome our numerical disadvantage.

The effectiveness of our deterrent depends upon our ability to maintain this technological superiority and our adversaries' belief in that ability. When our ability is questioned our deterrent is diminished and the threat of war increases.

In late 1987, then Secretary of Defense Frank Carlucci asked the Defense Science Board ("DSB") to review the effects of the many global political, economic, and technological changes which had occurred in the eight years since the DSB last reviewed the question. Mr. Carlucci emphasized his concerns about the apparent diminution of America's technological superiority and the erosion of our industrial and technology base. In further conversations, his clear desire to create a foundation for future national policy provided the principle framework for our study.

To accomplish the study, the DSB assembled a group of 28 leaders of the defense, financial, and academic communities. We organized our task group into seven subgroups to deal with a logical organization of these issues. The subgroups were on the subjects of: (1) globalization of the defense industrial base; (2) technology; (3) independent research and development; (4) management issues; (5) incentives in competition; (6) the subtiers of subcontractors and suppliers; and (7) maritime issues. Each of the subgroups produced principal findings and recommendations which were incorporated with those of the entire group in our final report. I request that a copy of the report be included in the record of this hearing.

In reaching our principal findings and recommendations we received briefings from nineteen senior DoD officials, ten officials from other government agencies, a combined congressional group, and twenty seven representatives of academia, industry, and various trade associations. In addition, many other individuals and organizations were interviewed by the subgroups.

Principal Findings

I wish to emphasize the principal findings made by the task force. They should form the basis for concerted action by the government and industry to resolve a large and growing problem. The task force found that:

- Of greatest importance is the fact that the continued deterioration of the industrial and technology base diminishes the credibility of the our deterrent. It is a national problem requiring a coordinated response by government and industry;

- Current acquisition policies and strategies do not sufficiently recognize that globalization of U.S. defense markets has made our nation partially and irreversibly dependent upon foreign sources. At the present time, neither DoD nor industry has the means of specifically defining the scope of dependence or of identifying all the systems and components which are affected;

- A pattern of inadequate long-term investment by prime and subtier suppliers is a primary cause of the increasing deterioration of the defense industrial and technology base. This inadequate investment can be attributed to:

    - pressure on defense industries to provide short-term returns equal to those available from lower risk investments;

    - uncoordinated effects of national economic and defense acquisition policies which further reduce the resources available for investment;

    - increasing uncertainties surrounding the defense budget and acquisition process; and,

    - the capital markets' perception of an imbalance between the risks taken and the possible rewards in the defense business.

- The performance and capabilities of the defense industrial and technology base is directly affected by changes to tax, trade, environmental, and socioeconomic policies. Because each directly affects the others, the making of national economic, defense, and foreign policies requires greater coordination of those policies in the executive branch and in Congress. Policy makers must find the means of measuring and coordinating these effects before they act.

- The maritime industries have deteriorated to the point where they cannot support national security objectives.

- Some members of the subcontractor and supplier community either refuse defense business or segregate older technology and older production lines from their commercial business to apply to defense. DoD acquisition policies engender this behavior.

- There is a lack of central management of the DoD technology based programs. Until they are brought under a more active management, with sufficient accountability for efficient expenditure of resources, the program will not achieve the significant benefits it is capable of producing.

As a result of making these findings, the DSB task force made ten principal recommendations as a means of addressing the long-term problem and creating a basis for a continuing effort to ensure that, the problem would not reoccur.

Principal Recommendations

1. Significant differences exist between industries capabilities and the tasks which national security strategy assumes industry can perform. Therefore, a cabinet level forum involving the appropriate executive branch agencies should be created to ensure that these problems are examined and resolved.

The task force recommended that an executive order be issued creating an industrial policy committee, possibly chaired by the National Security Advisor, to accomplish this task. We prepared and included in our report a draft presidential directive which was intended to create such a committee and charter it to:

- compare the tasks which national security plans assume industry can perform in peace and in war with industry's capabilities and current actions; and

- develop and recommend to the President specific legislative, regulatory, and resource initiatives which would resolve the differences.

Further, we recommended that the Secretary of Defense request membership on the Economic Policy Council of the Cabinet so that defense concerns are heard in the group's debates.

2. Surge planning and capabilities must be improved to account for both the realities of the potential threat and the dependency that we now have on foreign sources. Currently, there is neither an accepted statement of surge needs nor any inter-service integration of surge priorities. The ability to surge production must be demonstrated and exercised. In order to be effective, surge must begin on warning, before our forces are committed to a major conflict. Therefore, we recommended that the Secretary of Defense should:

- integrate surge capability in planning the acquisition process by using the Program Objective Memorandum and Program Decision Memorandum processes to guide programming and budgeting decisions and demonstrated commitment to surge;

- ensure the further development and expansion of the Joint Chiefs' "Joint Industrial Mobilization Planning Program" to assure setting inter-service priorities for industrial base capability and the linkage of these capabilities to executable military strategies; and

- for selected critical systems, identify, price, and purchase an eighteen month buffer stock of foreign-sourced components to protect against interruption of access to foreign supplies.

3. DoD's technology base is threatened by an inability to attract and retain high quality scientists, engineers and technical managers in the laboratories and R&D centers. We recommended that the Secretary of Defense should propose the transition of selected facilities to private sector operation as federally funded R&D centers of government-owned, contractor-operated facilities. For facilities not appropriate for private sector operation, support the urgent implementation of procedures to provide competitive compensation and to reward high quality technical talent.

4. Uncertainty about acquisition policies and strategies contributes to the pressures on industry to plan for short-term investments and avoid long-term risks. This uncertainty is compounded by the strong belief that the varying acquisition policies used by the services reflect continued instability. We recommended that the Undersecretary of Defense for Acquisition implement a consistent set of integrated acquisition policies. In doing so, the USD(A) should rview the services' acquisition policies to determine inconsistencies with DoD policies and direct that actions be taken to eliminate these differences and to impose specific objectives for industrial and technology base needs.

5. The DoD currently does not have the in-house capability to conduct the complicated financial analyses of the many acquisition, tax, and other economic policy changes affecting the industrial and technology base, therefore it is virtually impossible for DoD to ensure that its incentives system will accomplish its stated goals. We recommended that the USD(A) should support the use of incentives in acquisition strategies and policies to encourage long-term industry investment in new technology, improved production processes and modernized facilities.

As the foundation for these incentives, DoD should establish an in-house capability to perform standardized financial impact assessments of existing and prospective regulations, legislation, and acquisition strategies which affect capital formation and long-term investment.

6. Independent research and development has had a profound influence on the ability of industry to meet DoD's future needs. It has been the primary source of competitive approaches to the tactical and strategic problems which the DoD has faced. We recommended that the Secretary of Defense should reaffirm the importance of IR&D to the Defense Department, determine IR&D cost recovery ceilings in the context of a long-term assessment of technological requirements, not in the specific proportion to budget levels. We also recommended that the existing method of IR&D cost recovery be retained.

7. We found that competition has, through over-zealous implementation of congressional direction, come to mean awarding contracts on the basis of price alone. This emphasis reduces quality, and de-emphasizes innovation and technology. We recommended that procurement policies be revised to give sufficient emphasis not only to cost competition, but also to competition based on total product quality including such things as maintainability and operability and contractors' past performance.

8. We found that the decline of the U.S. maritime industry has reached the stage at which they can no longer deliver America's forces or supplies to the theater of war. We recommended that the Secretary of Defense define the capacity of the maritime transportation system, including the capacity of our allies,

establish those commitments necessary to meet national security objectives and thus develop a means to ensure a balance between capacity and requirements.

9. We found that DoD's recent efforts to reform the use of best and final offers ("BAFOs") impose higher level controls on the use of second or third BAFOs in a single procurement. The task force believed that although this restriction was a positive step, it would not effectively limit the use of BAFOs. Therefore, we recommended that the USD(A) should convene a high level joint government-industry working group to consider further modifications of regulations that would further reduce the use of best and final offers to an absolute minimum and that would eliminate repeated BAFOs.

10. We found that one of the principal difficulties in resolving the problems of the industrial base was caused by the public perception that there were fundamental ethical problems with the procurement system. As a step towards dealing with this, we recommended that the Secretary of Defense ensure that all defense contractors, suppliers, and consultants adopt and adhere to suitable codes of ethics to govern their business operations.

Conclusion

The breadth and complexity of the industrial base issue has, for more that forty years, led industry and government leaders away from dealing with its fundamental issues. Now, with our growing emphasis on conventional deterrence, and with the coming economic unification of Europe adding to the complexity of the issue, the DSB concluded that attention to this issue could be delayed no longer. We remain hopeful that both Congress and DoD will seriously examine these problems and move toward adoption of our principal recommendations.

Thank you very much for your attention to this important national policy issue.

Senator BINGAMAN. Thank you very much.

Before we ask any questions let me call on Mr. Murrin and Mr. Augustine.

Before I call on Mr. Murrin, did you have any statement you wanted to make, Mr. Chairman?

Senator NUNN. No.

Senator BINGAMAN. Mr. Murrin, go right ahead.

STATEMENT OF THOMAS J. MURRIN, DISTINGUISHED SERVICE PROFESSOR OF TECHNOLOGY, CARNEGIE-MELLON UNIVERSITY

Mr. MURRIN. Thank you, Mr. Chairman. I am delighted to be with you again and with your distinguished colleagues.

I think you know from earlier testimony and other discussions, I share a lot of the concerns that have been voiced here already this morning. But I am here on behalf of the new Defense Manufacturing Board to talk about an initiative that we think is very promising, and at least during its first 6 months of life, is utterly upbeat.

We have prepared, sir, a statement for the record, which we will leave. And what I thought we could best do with the time allocated is to "walk" briefly through each of our four new committees, and cite an example or two of the sort of initiatives that we are getting involved in, and try to explain credibly to you why we are enthused with the prospects of the new Defense Manufacturing Board.

I should make it clear that in many cases we are joining efforts that are already underway, and in a few cases we are initiating projects of our own. But we are not out, per se, to invent anything new; we are trying to "cherrypick," if you will, the most promising initiatives and to help translate those into tangible gains.

Speaking for myself at least, I think the potential relating to the activities the Defense Manufacturing Board is involved in, can translate and should translate to savings of many billions, perhaps tens of billions of dollars; to radical reductions in the time that it takes to develop, produce and deploy new weapons; and at the same time to substantially help the performance, particularly the reliability, of new weapons.

One of the four efforts relates to technology, particularly manufacturing technology, but it reaches into other areas as you probably expect. And the principal initiative here is what DOD is calling concurrent engineering. This relates to the testimony you apparently had yesterday from Dr. Branscomb, in which he is urging that when we develop new systems we simultaneously assure that these systems are highly produceable, and we concurrently specify the process that will be used to manufacture them.

I am sure it is well known to this committee and others that this is a practice generally used in much of commercial industry, particularly in Japan, and probably the most celebrated studies in recent years relates to comparisons in the automobile industry, where it is painfully clear the Japanese can now go from the concept of a new automobile, through its development and design and early prototyping, and into production in about one-half of the time that it typically takes us in the United States; and with an expenditure of engineering and technician and tooling hours in the same ratio, about one-half.

A lot of people have looked carefully at the prospect of applying the same principles of concurrent engineering to weapon systems, and virtually universally conclude that the same kind of gains are attainable there; indeed, must be attained. That is, if we apply effectively concurrent engineering, the time and front-end cost required can be radically reduced.

I would opine that, in regard to weapon systems, there is another stimulus that should motivate us to implement these concurrent engineering initiatives as fast as practical; and that is the frightful prospect that the Soviets might learn some of the same principles of concurrent engineering and be able to deploy new military technology much more rapidly than we.

As a citizen, I find the prospects of that kind of chilling, but I suggest it as another stimulus to move on with this effort.

Also under the purview of the technology activities are ManTech and IMIP, which have been discussed here. I will simply assert, and here I am speaking for myself, that there is no way really to reconcile our apparent commitment to competitiveness and industrial base and to assign, at least wordwise, high priorities to manufacturing; and then look at the rather miniscule level of monies and resources that we typically apply in the ManTech and IMIP areas.

Indeed, as you have mentioned, the performance of the Air Force in this regard is tremendously impressive. And one of the things we are going to work hard at doing, and hopefully we will succeed, is to get more resources allocated into ManTech and IMIP so that tremendous gains can be made as a result. And we are very optimistic about that.

The second of the four committees is called Industrial Base. And that conjures up concerns over ball bearings, as has already been mentioned, machine tools and the like. Happily, perhaps, this group has decided to concentrate its early efforts on supporting the emerging program relating to high definition television. As you well know, DARPA is taking a key role in this regard; and the Defense Manufacturing Board is committed to develop efforts to support DARPA and to cooperate with the other agencies in this very complex and challenging undertaking.

Very often we are asked, and perhaps you are asked: Why HDTV? Speaking for myself, I can think of no reason why I would like to see current television offerings more clearly and more lucidly on my home television set. Aside from sports events, I can hardly stomach what we now have.

But the issue, as I am sure you know, is that if we do not do well, as a country, in this initiative, it is virtually certain that we put in jeopardy the future of our semiconductor industry, our computer industry and our telecommunications industries. Those are all vital to our national security interests; they clearly are vital to our commercial industrial interests. And that, in my view at least, would be a calamity.

So we are joining in that promising effort. And that is a major initiative of the Industrial Base Committee.

At the same time, this group is taking on the very difficult, but we think very important and promising task, of trying to identify more clearly what are strategic industries, both in a security and industrial competitiveness context, and what should be done as a matter of policy and procedure regarding investments, ownership, control of such industries, in our United States by foreign organizations.

That probably is going to take some time, but it is another example of a current initiative.

The third committee relates to human resources. This, of course, as you well know, is a very challenging and complex area also. But just to give you quickly one exciting specific opportunity that we think we have, it has been brought to our attention that each year the Department of Defense authorizes about 20,000 scholarships for entering students on American college and university campuses. Apparently no formal aggressive effort has been made earlier to interest a significant number of those brightest and best young Americans, in being trained on campus in manufacturing, and then, in turn, going into manufacturing as a career pathway.

We have not, frankly, figured out quite exactly how we are going to do this, but we are going to make a major effort to try to capture the interest of a lot of these young people, perhaps 20 to 30 percent of them, to be trained formally at the university level in manufacturing; and then, hopefully, to take that on as a career.

One of the major problems we have as a country, as I am sure you know, is the amount of brain power that goes into the manufacturing organizations in our companies is trivial compared to our counterpart foreign competitors. In studies I have participated in frequently in Japan, usually the number of professional engineers in a comparable Japanese factory is 5 to 10 times the number of professionals we will have in an American organization. That says something about our priorities, about our educational initiatives; and as I pointed out here, hopefully something that we can address effectively in the Human Resources Committee of our Defense Manufacturing Board.

Senator NUNN. Could I ask you to repeat that? Five to 10 times the number of engineers; I am not sure in what respect.

Mr. MURRIN. I have had the opportunity, Senator, to visit Japan since November of 1964, fairly often. That has been kind of my avocation. As an important part of findings in many study trips made there, it typically is the case that if you go into a manufacturing organization in Japan that is similar to one in the United States, and you literally count the number of college-trained professional people working in the manufacturing organization in the Japanese plant, and compare it with the number of college-trained professional people working in a manufacturing organization in the American plant, the disparity can be 5 to 10 times.

Senator WALLOP. In engineering?

Mr. MURRIN. No. I am talking about manufacturing. You see, this gets very complex. You might say, well, how can that be; they produce about the same number of total engineers as we? And how can they compete? Well, oversimplified, they are using our U.S. universities and our U.S. laboratories as their principal source of R&D know-how.

So when you count scientists, the disparity can often be in the opposite direction; because they are exploiting our scientific know-how. But when you get to manufacturing, the head count is in their favor. I think there are countless studies, and I am sure this has been brought to your attention: they typically have much higher expenditures, much more professional people, much higher priorities assigned to manufacturing than we. And I think that is clearly one of the key reasons why they have excelled competitively in areas where we face them. No question about that.

Finally and fourthly, the Defense Manufacturing Board has a very exciting initiative called Quality. And let me cite quickly three aspects of this.

DOD earlier, under Secretary Frank Carlucci, as you must know, initiated a total quality management program, and it has been mentioned this morning. And as far as we can tell, it is absolutely first class. It is well thought out. It embodies the best of proven practices, both in the States and abroad, and should be implemented as soon as practical.

One of the questions posed to use early on related to the Malcolm Baldrige National Quality Award process, which I am sure you know is managed, and very effectively, by the Department of Commerce, and involved the first of a series of awards last November at the White House.

The question put to us was whether DOD and its contractors should have anything like that process, whether they should have their own process, or whether they should join in the National Quality Award process. It is clear, after carefully reviewing it, that prudence is on the side of joining the Malcolm Baldrige National Quality Award process. And so we are getting ready to make major efforts to encourage defense contractors to do just that.

The process, as you probably know, is an interesting one in that it is an adaptation essentially of the Deming Award process that has been practiced so effectively in Japan for over 30 years. And Deming, of course, was an American. So here we are doing happily something to the Japanese, as it were, that they typically do so effectively to us. We are taking something that they have demonstrated to be very effective in a competitiveness sense and adapting it to our situation.

The third and related quality initiative is to hopefully develop the Department of Defense as a world-class customer.

Let me end by just taking a moment on this, because this is a truly exciting suggestion, probably one that is going to be very, very difficult to implement, but very, very promising. And it is due largely to Motorola and to the chairman of the Quality Committee, Chris Galvin, who you probably know to be one of their senior executives.

Chris tells this story of Motorola going to Japan some years ago to break into the pager business at Nippon Telephone & Telegraph, to apparently be welcomed there, to be given sets of specifications, to be assured that if they could meet the specs they would be considered as a supplier of pagers to this large Japanese firm.

At that time, Motorola was the leading pager company in the United States and they thought they were the leading pager company in the world. They took the specifications back home, studied them carefully, and literally concluded that not only could they not meet those specifications, no company in the world could meet those specifications; they were irrational, they were unattainable. And they dutifully prepared visuals to demonstrate these insights they came to, flew back to Japan and briefed the NTT executives with their findings.

The Japanese listened with interest, thanked them for their views and then brought out three Japanese pagers made by that many different companies who they asserted completely met without any exception the entire specification; and offered to show them all of the test data involved. Obviously they could not explain how the Japanese companies did that.

Well, the Motorola executives were very bright. They saw that the issue was not only whether they could break into NTT, but whether over time they could survive as a pager supplier. Because here were three Japanese companies meeting these important specifications.

Well, to make a long story charitably brief and happy, they figured out how to do that. They are now the leading supplier of pagers to NTT, literally. They are the leading supplier of pagers in the world. And in their own self-judgment, that is the principal reason why when this process of quality commitment started to permeate over the last several years, all of Motorola, they were able to be the only American company, as a company, to win the Malcolm Baldrige National Quality Award. And equally important, they greatly increased their sales and profits in the last few years.

So the concept is that they look upon the role that NTT played as a "World-class Customer" who caused them to set their sights much higher than they thought could be attained, to do things to improve the reliability; and in so doing, cut the cost and the time of producing this product. And that turned out to be incredibly beneficial to them.

As Chris asks, and now our committee asks, why could not and should not the Department of Defense, where reliability and quality are of crucial importance, why could not they begin to play the role in the United States of a "World-class Customer?"

And as has been mentioned here earlier, because DOD buys such a high percentage of the total manufactured products in this country, have that be a tremendously beneficial impact on a large number of not only defense suppliers, but commercial suppliers who, by kind of osmosis within the organization, would have these same practices spin off and benefit.

So I take a few moments on that with your forebearance because we think it really is an exciting concept, that of world-class customer. Whether or not this gets implemented, of course, remains to be seen. But it is one of the reasons, gentlemen, why we are very, very enthused about the new Defense Manufacturing Board, why we are very much indebted to you and the administration, and particularly DOD, and most particularly Dr. Bob Costello for providing the opportunity to get so organized and to get this effort underway.

Thank you very much.

[The prepared statement of Mr. Murrin follows:]

STATEMENT OF

MR. THOMAS J. MURRIN

CHAIRMAN, DEFENSE MANUFACTURING BOARD

MR. CHAIRMAN AND DISTINGUISHED MEMBERS OF THE COMMITTEE, IT IS TRULY AN HONOR TO APPEAR TODAY TO DISCUSS PERSPECTIVES ON THE HEALTH OF THE NATION'S DEFENSE INDUSTRIAL BASE.

YOUR LETTER OF INVITATION ASKED FOR AN ASSESSMENT OF THE STATE OF THE BASE AND WHAT CAN BE DONE TO IMPROVE IT.

IT APPEARS THAT WE ARE WITNESSING THE DECLINE OF MANY OF OUR INDUSTRIAL BASE CAPABILITIES. OUR ABILITY TO SURGE PRODUCTION IN CRITICAL SYSTEMS OR CONSUMABLES OR, EVEN MORE SERIOUSLY, TO PROVIDE THE STRENGTH OF CONVENTIONAL DETERRENCE THAT WE NEED TO PREVENT US FROM HAVING TO GO TO WAR IS IN QUESTION. THIS DECLINE, IN SOME INDUSTRIES, HAS BEEN UNDERWAY FOR WELL OVER A DECADE --- AND SEEMS TO BE SPREADING IN MORE SECTORS NECESSARY TO SUPPORT DEFENSE PRODUCTION.

THIS PROBLEM IS ONE OF THE FOREMOST PUBLIC POLICY ISSUES FACING OUR COUNTRY TODAY, NOT ONLY FOR THE OBVIOUS DEFENSE IMPLICATIONS, BUT FOR OUR LONG TERM STANDARD-OF-LIVING. WE ARE APPARENTLY BEGINNING TO APPRECIATE HOW CLOSELY MILITARY STRENGTH IS LINKED, AND DEPENDENT UPON, THE SUCCESS OF COMMERCIAL INDUSTRY. THE PROBLEM GOES BEYOND BEING JUST A DEFENSE ISSUE AND ITS SOLUTION, AND THEREFORE WILL REQUIRE

INITIATIVES BEYOND THE DEPARTMENT OF DEFENSE.

THE REASONS FOR THE DECLINE IN THE INDUSTRIAL BASE ARE NUMEROUS AND COMPLEX. TURNING THIS DECLINE AROUND WILL BE VERY CHALLENGING. IT WILL TAKE A CONCERTED AND SUSTAINED EFFORT BY AMERICAN MANAGEMENT --- AND OTHER LEADERS --- TO REGAIN THE LEADERSHIP WE ONCE HAD. PERHAPS THE SINGLE MOST SIGNIFICANT SECRET-TO-SUCCESS IN COMPETITIVE MARKETS IS QUALITY IMPROVEMENT. WHILE THERE IS EVIDENCE THAT CERTAIN U.S. COMPANIES ARE RISING TO THIS CHALLENGE, CORPORATE ACTION ALONE WILL PROBABLY NOT BE ADEQUATE OVER THE LONG RUN.

WE HAVE MUCH TO LEARN ON THIS ISSUE FROM WHAT'S GOING ON THROUGHOUT THE WORLD. WHILE WE SHOULDN'T ATTEMPT TO DUPLICATE WHAT OTHER NATIONS ARE DOING, THERE ARE LESSONS WE CAN LEARN FROM THE JAPANESE AND THE PACIFIC BASIN, AND FROM THE GERMANS AND THE EUROPEAN CONTINENT. ONE OF THESE LESSONS IS THAT COOPERATION BETWEEN GOVERNMENT AND INDUSTRY CAN PAY OFF HANDSOMELY. WHILE MANY OF US MAY WISH FOR A SO-CALLED FREE-MARKET WHERE PRIVATE INGENUITY PRINCIPALLY DETERMINES SUCCESS, THIS CONCEPT HAS BECOME INCREASINGLY INEFFECTIVE BECAUSE OF THE COMPETITIVE REALITIES WE FACE . . . PARTICULARLY IN THE PACIFIC BASIN.

THEREFORE, OUR GOVERNMENT AND OUR INDUSTRY NEED TO WORK TOGETHER MUCH MORE EFFECTIVELY TO PROTECT OUR LIVING STANDARDS AND OUR NATIONAL SECURITY.

I AM PRIVILEGED TO BE INVOLVED IN JUST SUCH A COOPERATIVE VENTURE --- SERVING AS

THE CHAIRMAN OF DOD'S MANUFACTURING BOARD (DMB). THE DMB WAS FORMED BY THE DEFENSE DEPARTMENT TO PROVIDE A NON-ADVERSARIAL MEANS OF COMMUNICATION AND COOPERATION BETWEEN THE DEPARTMENT AND INDUSTRY. THE DOD FELT THAT AN INSTITUTIONAL MECHANISM FOR COOPERATIVE PROBLEM SOLVING WOULD HELP RAISE THE PRIORITY OF MANUFACTURING WITHIN THE DEPARTMENT WHILE PROVIDING AN EFFECTIVE MECHANISM FOR APPLYING THE BEST PRIVATE SECTOR PRACTICES TO MILITARY EQUIPMENT PRODUCTION.

WHILE I CAN'T YET TELL YOU THAT WE'VE MET THAT OBJECTIVE, I CAN SAY WE ARE WORKING HARD TO DO SO, AND THAT WE SEEM TO BE MAKING MUCH PROGRESS. OUR FIRST MEETING WAS HELD OVER SIX MONTHS AGO --- AND SINCE THEN, OUR BOARD HAS MET FORMALLY FOUR TIMES. WE HAVE ORGANIZED OUR MEMBERSHIP INTO FOUR COMMITTEES. EACH OF THE COMMITTEES HAS MET SEPARATELY AND HAS DEFINED VERY PROMISING PROJECTS WE THINK SHOULD BE PURSUED. WE HAVE BRIEFED THE DEPARTMENT ON THIS AGENDA AND HAVE BEEN ENCOURAGED TO PURSUE IT. THE DEPARTMENT HAS FORMALLY REQUESTED THE BOARD TO INITIATE FOUR PROJECTS. A TASK FORCE HAS BEEN ESTABLISHED FOR ONE OF THESE PROJECTS AND WE HOPE TO HAVE THE OTHER THREE IN OPERATION SHORTLY.

WE HAVE MET WITH EACH OF THE SERVICE ACQUISITION EXECUTIVES TO IDENTIFY SERVICE SPECIFIC MANUFACTURING PROBLEMS AND TO ESTABLISH COOPERATIVE RELATIONS WITH EACH OF THE SERVICES; AS WELL AS OSD. WE HAVE CONDUCTED A WORKSHOP --- UNDER THE SPONSORSHIP OF DARPA --- TO PROVIDE GUIDANCE TO THEIR TECHNICAL AGENDA. WE HAVE ESTABLISHED A PROMISING RELATIONSHIP WITH

THE DEPARTMENT OF COMMERCE AND HAVE HAD A NUMBER OF OTHER FEDERAL AGENCIES INVOLVED IN OUR ACTIVITIES.

OUR DMB WILL PRODUCE PROMISING POLICY RECOMMENDATIONS RELATING TO MANUFACTURING --- PROBABLY BEFORE THE YEAR IS OUT.

TO GET BACK TO YOUR ORIGINAL QUESTION AS TO HOW THE INDUSTRIAL BASE MIGHT BE IMPROVED, I WOULD LIKE TO BRIEFLY DESCRIBE THE SUBSTANTIVE DIRECTION OF THE DEFENSE MANUFACTURING BOARD; IN TERMS OF ITS COMMITTEE STRUCTURE . . .

BILL BROWN, PRESIDENT OF MCDONNELL DOUGLAS HELICOPTER COMPANY, CHAIRS THE TECHNOLOGY COMMITTEE WHICH IS RESPONSIBLE FOR OUR TASK FORCE ON CONCURRENT ENGINEERING. THIS PROJECT SEEKS TO APPLY THE SUCCESS OF COMMERCIAL INDUSTRY IN THE PARALLEL DESIGN AND DEVELOPMENT OF PRODUCT AND PROCESS TO MILITARY PRODUCTION. AS YOU PROBABLY KNOW, THE JAPANESE AUTO INDUSTRY INTRODUCES A NEW CAR IN ABOUT THREE YEARS --- COMPARED TO OUR FIVE OR MORE --- AND DOES SO WITH ABOUT HALF THE ENGINEERING MAN HOURS AND DEVELOPMENT COSTS. THIS PROCESS --- CALLED CONCURRENT ENGINEERING BY DOD --- CAN, AND MUST, BE USED ON OUR FUTURE WEAPON SYSTEMS.

THE TECHNOLOGY COMMITTEE IS ALSO SUGGESTING PROJECTS EXAMINING DOD'S MANUFACTURING INVESTMENT STRATEGY FROM A PRODUCT LIFE CYCLE PERSPECTIVE. THIS PROJECT WILL LOOK AT EFFORTS TO ACHIEVE GREATER MANUFACTURING EFFICIENCY --- INCLUDING MANPOWER; RESOURCES; AND PRIORITY INITIATIVES IN R&D, GOING ALL THE WAY

THROUGH TO PRODUCTION AND DEVELOPMENT. THEIR THIRD PROJECT WILL EXAMINE TECHNOLOGY TRANSFER POLICY --- RELATIVE TO BOTH ADVERSARIAL AND FRIENDLY NATIONS; A CHALLENGING UNDERTAKING.

OUR INDUSTRIAL BASE COMMITTEE IS CHAIRED BY HOWARD SAMUEL, PRESIDENT OF THE INDUSTRIAL UNION DEPARTMENT OF THE AFL-CIO. THREE OTHER PROJECTS THAT THE DOD HAS ASKED THE BOARD TO UNDERTAKE WILL BE CONDUCTED UNDER THIS COMMITTEE. THE FIRST WILL DEVELOP A METHODOLOGY TO IDENTIFY AND PRIORITIZE STRATEGIC INDUSTRIES --- AND THIS WILL DEVELOP A FRAMEWORK FOR DOD INVOLVEMENT WITH THESE STRATEGIC INDUSTRIES. A SECOND PROJECT WILL BE RELATED TO THE FIRST IN THAT IT WILL DEVELOP A RECOMMENDED DOD STRATEGY FOR ONE OF DARPA'S PRIORITY AREAS, HIGH DEFINITION SYSTEMS; INCLUDING HDTV. A THIRD PROJECT WILL EXAMINE THE DOD POLICIES RELATED TO FOREIGN OWNERSHIP AND CONTROL OF DEFENSE PRODUCTION --- AND SUGGEST APPROPRIATE POLICIES AND PROCEDURES.

OUR HUMAN RESOURCES COMMITTEE IS CHAIRED BY DAVID BING, CHAIRMAN OF BING STEEL IN DETROIT. ONE PROJECT WILL EXPLORE HOW MANUFACTURING MANAGEMENT CAN BE SUBSTANTIALLY IMPROVED THROUGH MORE EFFECTIVE UTILIZATION OF THE INTERNAL DOD EDUCATION AND TRAINING SYSTEM. ANOTHER PROJECT WILL DETERMINE MEANS OF ENCOURAGING UNIVERSITY INTEREST IN MANUFACTURING THROUGH SUCH MECHANISMS AS TECHNOLOGY OR INDUSTRY SPECIFIC CENTERS OF EXCELLENCE AND THROUGH THE MANY THOUSANDS OF COLLEGE SCHOLORSHIPS PROVIDED ANNUALLY BY DOD. THAT IS, WE SHOULD CONVINCE MANY OF OUR COLLEGE STUDENTS TO TAKE COURSES IN MANUFACTURING --- AND

THEN TO ENTER MANUFACTURING AS AN EXCITING CAREER. A THIRD PROJECT WILL SEEK TO HELP STIMULATE BROAD NATIONAL ATTENTION TO THE NEED FOR STRENGTHENED TECHNICAL EDUCATION.

OUR FOURTH COMMITTEE IS THE QUALITY COMMITTEE CHAIRED BY CHRIS GALVIN, SENIOR VICE PRESIDENT OF MOTOROLA. THIS COMMITTEE IS WORKING WITH THE DEPARTMENT TO ACCELERATE THE IMPLEMENTATION OF THEIR IMPRESSIVE TOTAL QUALITY MANAGEMENT PROGRAM. AS PART OF THIS EFFORT, WE ARE ENCOURAGING DOD CONTRACTORS TO PARTICIPATE IN THE MALCOLM BALDRIGE NATIONAL QUALITY AWARD PROCESS. THIS PROCESS --- AS YOU PROBABLY KNOW --- ADAPTS THE RELEVANT, BEST-PRACTICES OF JAPAN'S DEMING AWARD PROCESS --- AND IS OF EXTRAORDINARY POTENTIAL IN REGARD TO IMPROVING THE RELIABILITY OF AMERICAN WEAPON SYSTEMS WHILE REDUCING THEIR COST, AND THE TIME REQUIRED TO DEVELOP AND PRODUCE THEM. ANOTHER QUALITY PROJECT IS PERHAPS THE MOST CHALLENGING --- AND THE MOST PROMISING. THIS WILL ATTEMPT TO BENEFIT FROM BEST AMERICAN COMMERCIAL EXPERTISE TO DEVELOP PILOT PROJECTS TO DEMONSTRATE THE POTENTIAL OF THE DOD TO BECOME A "WORLD CLASS CUSTOMER" --- AND THEREBY STIMULATE DOD SUPPLIERS TO PERFORM, TIME AND COST PERFORMANCE LEVELS BEYOND WHAT THEY BELIEVE THEY TYPICALLY CAN ACHIEVE. THIS IS TRULY AN EXCITING CONCEPT --- WITH GREAT POTENTIAL!

WITH THE EXCEPTION OF FOUR PROJECTS THE DEPARTMENT HAS FORMALLY ASKED THE DMB TO TAKE ON, THE OTHERS ARE, AT THIS STAGE, RELATIVELY INFORMAL AND SUBJECT TO THE APPROVAL OF THE DEPARTMENT. WE WILL CONTINUE TO WORK CLOSELY WITH THE DOD TO

BOTH LISTEN, AND TO SUGGEST, WHERE OUTSTANDING OPPORTUNITIES EXIST. WHILE THE JURY IS STILL OUT ABOUT THE EFFECTIVENESS OF THE DMB, WE HAVE A MEMBERSHIP BOTH CAPABLE OF, AND COMMITTED TO, ITS SUCCESS. I'M CONFIDENT THAT DMB CAN HELP DOD SAVE MANY BILLIONS OF DOLLARS --- WHILE ENHANCING THE NATION'S SECURITY, AND, AT LEAST INDIRECTLY, CONTRIBUTING TO OUR STANDARD OF LIVING.

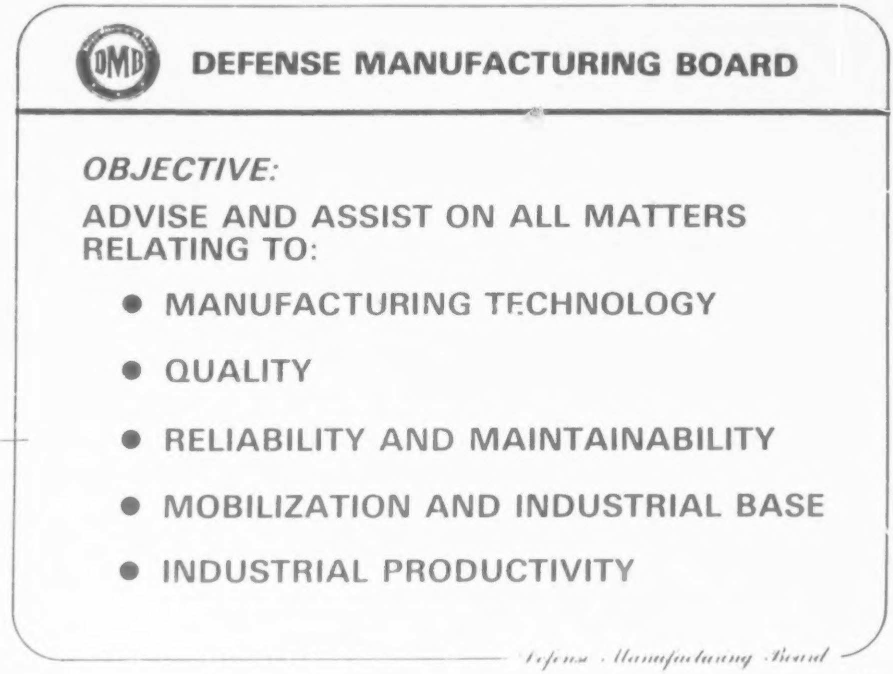
WE SINCERELY INVITE YOUR COMMENTS AND SUGGESTIONS AS TO HOW THE BOARD CAN ACHIEVE ITS GOALS! WE LOOK FORWARD TO WORKING WITH YOU IN THE FUTURE.

THANK YOU FOR THIS VALUED OPPORTUNITY TO BRIEFLY DESCRIBE ONE VERY PROMISING ACTIVITY IN CONTRIBUTING TO AN IMPROVED INDUSTRIAL BASE IN OUR COUNTRY!

DEFENSE MANUFACTURING BOARD

THOMAS J. MURRIN, CHAIRMAN

Defense Manufacturing Board



DEFENSE MANUFACTURING BOARD

OBJECTIVE:

ADVISE AND ASSIST ON ALL MATTERS RELATING TO:

- MANUFACTURING TECHNOLOGY
- QUALITY
- RELIABILITY AND MAINTAINABILITY
- MOBILIZATION AND INDUSTRIAL BASE
- INDUSTRIAL PRODUCTIVITY

Defense Manufacturing Board

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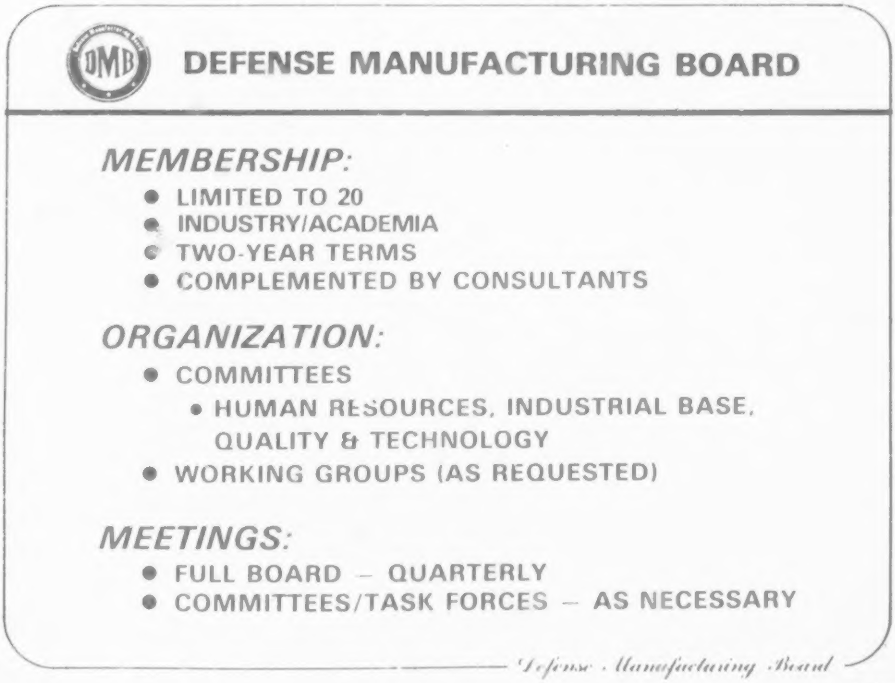

DEFENSE MANUFACTURING BOARD

MEMBERSHIP:

- LIMITED TO 20
- INDUSTRY/ACADEMIA
- TWO-YEAR TERMS
- COMPLEMENTED BY CONSULTANTS

ORGANIZATION:

- COMMITTEES
  - HUMAN RESOURCES, INDUSTRIAL BASE, QUALITY & TECHNOLOGY
- WORKING GROUPS (AS REQUESTED)

MEETINGS:

- FULL BOARD – QUARTERLY
- COMMITTEES/TASK FORCES – AS NECESSARY

Defense Manufacturing Board

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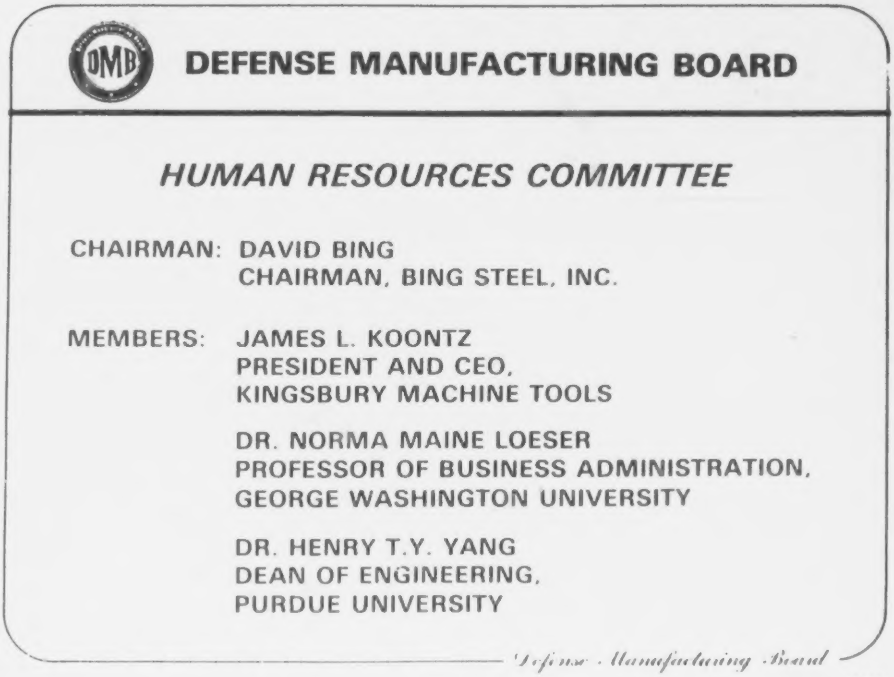

DEFENSE MANUFACTURING BOARD

HUMAN RESOURCES COMMITTEE

CHAIRMAN: DAVID BING
CHAIRMAN, BING STEEL, INC.

MEMBERS: JAMES L. KOONTZ
PRESIDENT AND CEO,
KINGSBURY MACHINE TOOLS

DR. NORMA MAINE LOESER
PROFESSOR OF BUSINESS ADMINISTRATION,
GEORGE WASHINGTON UNIVERSITY

DR. HENRY T.Y. YANG
DEAN OF ENGINEERING,
PURDUE UNIVERSITY

Defense Manufacturing Board

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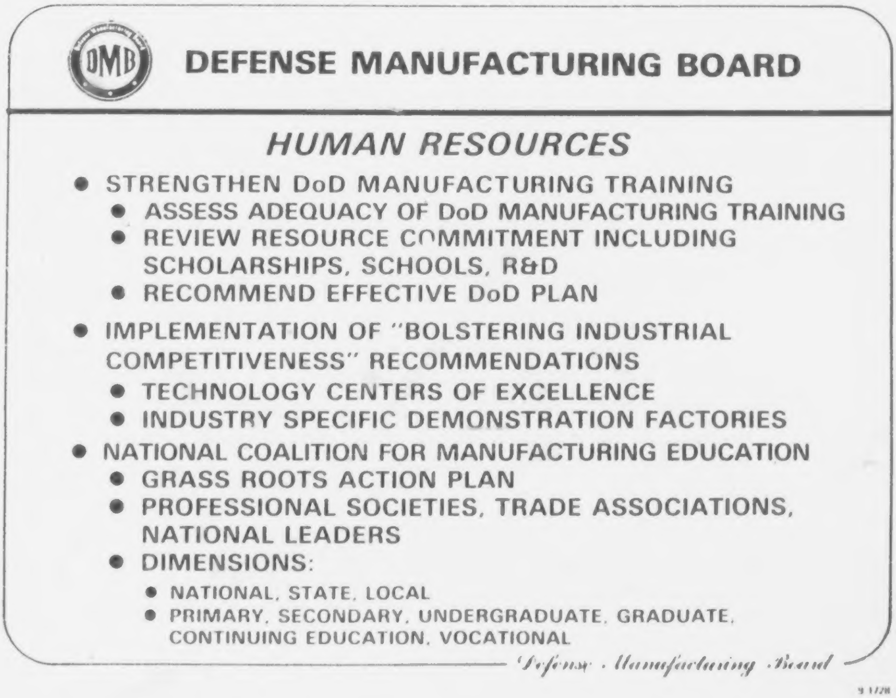

DEFENSE MANUFACTURING BOARD

HUMAN RESOURCES

- STRENGTHEN DoD MANUFACTURING TRAINING
  - ASSESS ADEQUACY OF DoD MANUFACTURING TRAINING
  - REVIEW RESOURCE COMMITMENT INCLUDING SCHOLARSHIPS, SCHOOLS, R&D
  - RECOMMEND EFFECTIVE DoD PLAN
- IMPLEMENTATION OF "BOLSTERING INDUSTRIAL COMPETITIVENESS" RECOMMENDATIONS
  - TECHNOLOGY CENTERS OF EXCELLENCE
  - INDUSTRY SPECIFIC DEMONSTRATION FACTORIES
- NATIONAL COALITION FOR MANUFACTURING EDUCATION
  - GRASS ROOTS ACTION PLAN
  - PROFESSIONAL SOCIETIES, TRADE ASSOCIATIONS, NATIONAL LEADERS
  - DIMENSIONS:
    - NATIONAL, STATE, LOCAL
    - PRIMARY, SECONDARY, UNDERGRADUATE, GRADUATE, CONTINUING EDUCATION, VOCATIONAL

Defense Manufacturing Board

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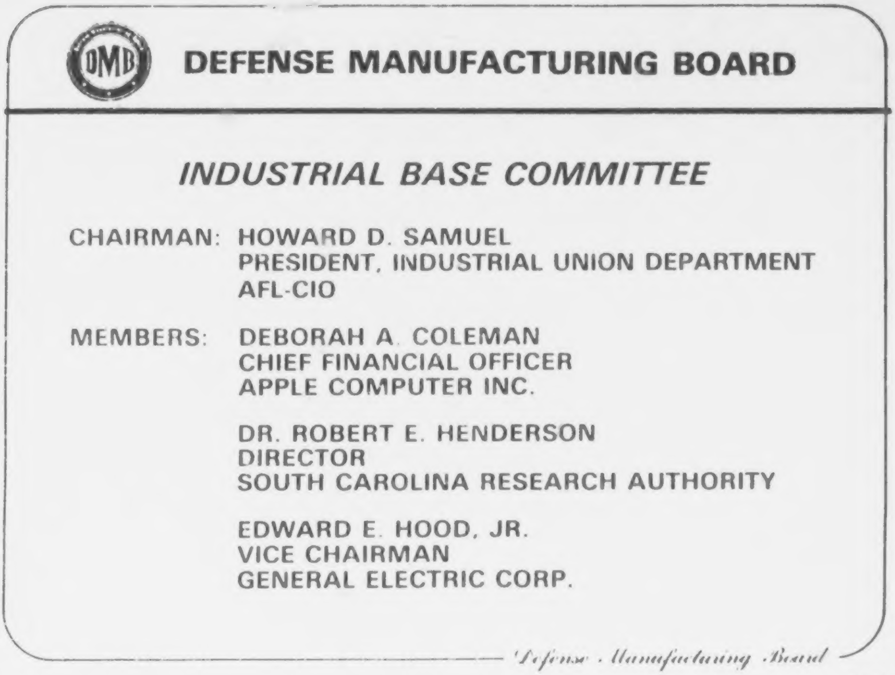

DEFENSE MANUFACTURING BOARD

INDUSTRIAL BASE COMMITTEE

CHAIRMAN:	HOWARD D. SAMUEL PRESIDENT, INDUSTRIAL UNION DEPARTMENT AFL-CIO
MEMBERS:	DEBORAH A. COLEMAN CHIEF FINANCIAL OFFICER APPLE COMPUTER INC.
	DR. ROBERT E. HENDERSON DIRECTOR SOUTH CAROLINA RESEARCH AUTHORITY
	EDWARD E. HOOD, JR. VICE CHAIRMAN GENERAL ELECTRIC CORP.

Defense Manufacturing Board

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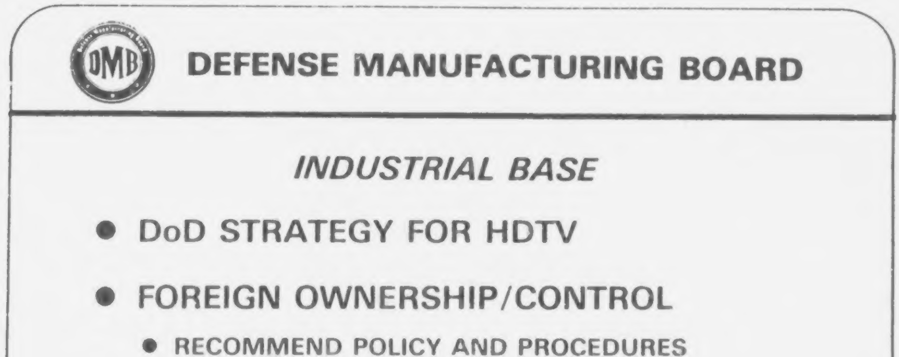

DEFENSE MANUFACTURING BOARD

INDUSTRIAL BASE

- DoD STRATEGY FOR HDTV
- FOREIGN OWNERSHIP/CONTROL
  - RECOMMEND POLICY AND PROCEDURES
- DEFENSE INDUSTRIAL STRATEGIC PLAN
  - IDENTIFY CRITICAL INDUSTRIES
  - METHOD FOR PRIORITIZATION
  - RESOURCE/ACTION PLAN

Defense Manufacturing Board

9 1720

DEFENSE MANUFACTURING BOARD

QUALITY COMMITTEE

CHAIRMAN:	CHRISTOPHER B. GALVIN SENIOR VICE PRESIDENT MOTOROLA, INC.
MEMBERS:	DR. DON P. CLAUSING PROFESSOR OF ELECTRICAL ENGINEERING & COMPUTER SCIENCE MASSACHUSETTS INSTITUTE OF TECHNOLOGY
	DR. HARRY V. ROBERTS PROFESSOR OF STATISTICS UNIVERSITY OF CHICAGO
	JAMES R. STANLEY VICE PRESIDENT OF OPERATIONS TEXTRON LYCOMING

Defense Manufacturing Board

9-1720

DEFENSE MANUFACTURING BOARD

QUALITY

- ACCELERATE IMPLEMENTATION OF TQM
- PROMOTE MALCOLM BALDRIGE NATIONAL QUALITY AWARD PROCESS
- COMMERCIALIZE DoD SOLDERING REQUIREMENTS AND PRACTICES
- DEVELOP DoD AS "WORLD CLASS CUSTOMER"
  - PILOT PROJECTS
  - IMPLEMENT OSD INNOVATION CENTER

Defense Manufacturing Board

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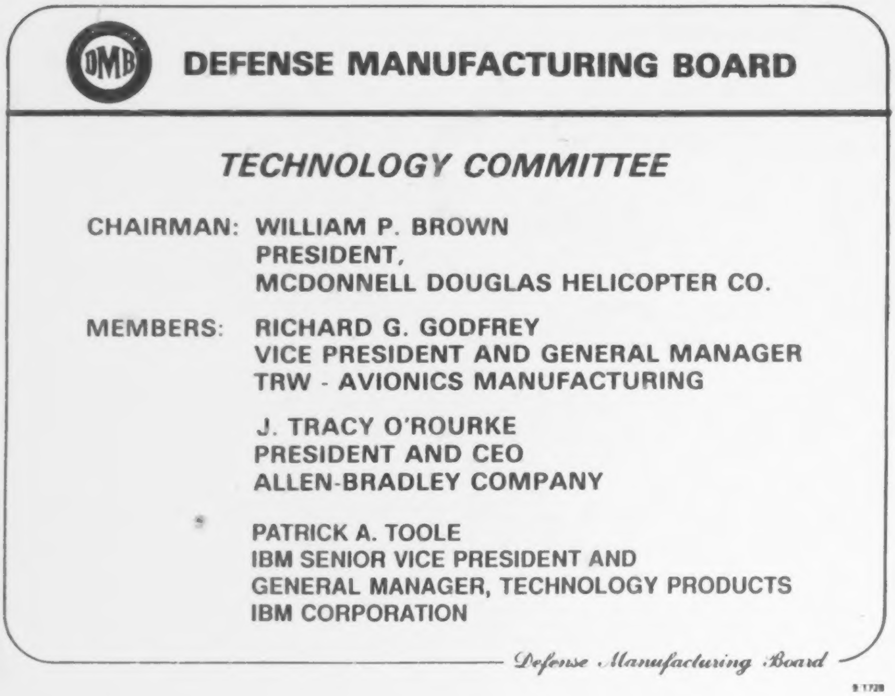


DEFENSE MANUFACTURING BOARD

TECHNOLOGY COMMITTEE

CHAIRMAN: WILLIAM P. BROWN
PRESIDENT,
MCDONNELL DOUGLAS HELICOPTER CO.

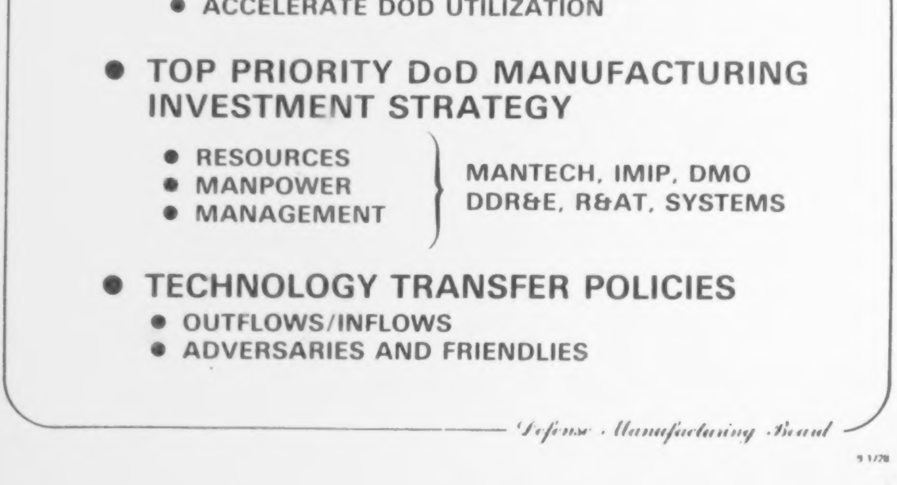
MEMBERS: RICHARD G. GODFREY
VICE PRESIDENT AND GENERAL MANAGER
TRW - AVIONICS MANUFACTURING

J. TRACY O'ROURKE
PRESIDENT AND CEO
ALLEN-BRADLEY COMPANY

PATRICK A. TOOLE
IBM SENIOR VICE PRESIDENT AND
GENERAL MANAGER, TECHNOLOGY PRODUCTS
IBM CORPORATION

Defense Manufacturing Board

9 1/28



DEFENSE MANUFACTURING BOARD

TECHNOLOGY

- CONCURRENT ENGINEERING
  - ACCELERATE DOD UTILIZATION
- TOP PRIORITY DoD MANUFACTURING INVESTMENT STRATEGY
  - RESOURCES
  - MANPOWER
  - MANAGEMENT

} MANTECH, IMIP, DMO
DDR&E, R&AT, SYSTEMS

- TECHNOLOGY TRANSFER POLICIES
  - OUTFLOWS/INFLOWS
  - ADVERSARIES AND FRIENDLIES

Defense Manufacturing Board

9 1/28

Senator BINGAMAN. Thank you very much.

Our final witness this morning is a familiar witness before the Armed Services Committee, one we have great respect for: Mr. Norm Augustine. We are very pleased to have you here.

STATEMENT OF NORMAN R. AUGUSTINE, CHAIRMAN, MARTIN MARIETTA CORP.

Mr. AUGUSTINE. Thank you, Mr. Chairman and members of the committee. It is a privilege to be here as always.

I realize that the subject of the defense industrial base is not one that is terribly exciting to the public at large. It is, though, terribly important to the public at large.

I would just like to say personally I appreciate the interest that your committee has shown on this subject for several years now.

With the committee's permission, I would like to submit a formal statement for the record and speak informally.

Senator BINGAMAN. We will certainly include it in the record.

Mr. AUGUSTINE. Thank you.

Although I am a chairman of the Defense Policy Advisory Committee on Trade [DPACT], my comments this morning will be in my own capacity. Most of what I say, however, I believe will be consistent with the views of the DPACT.

I might just briefly describe for the record what the DPACT is. It consists of a group of about 35 individuals, mostly CEOs, of defense-related corporations at various tiers in the defense contracting process. Each serves not as a representative of their company, but rather in their own individual capacity. We work for the Secretary of Defense and the U.S. Trade Representative. We provide advice from the industrial perspective to the Secretary of Defense and the U.S. Trade Representative on issues affecting defense trade and the defense industrial base, the two both being a part of the DPACT charter. These subjects are closely intertwined since obviously, with a weak defense industrial base it is not possible to have a defense industry that is competitive in trade in the international market.

Correspondingly, if we have a weak trade position, particularly in the commercial sector, this hurts the quality of the defense industrial base and our mobilization capacity.

Today about 15 percent of the output of the defense industrial base goes to exports. When one adds to that closely related industries, such as the commercial aircraft manufacturing industry, that fraction increases further. And of course there are many companies that are not in the classic defense industrial base, such as shipbuilders and the automobile manufacturers, that are important to defense mobilization.

I would also like to say as a preface, that defense industrial trade policy is quite different from normal trade policy. Certainly one has to keep in mind that national policy needs to be paramount to the interests of any firms in the defense industry because of the very nature of the products with which one is dealing.

In short, one certainly cannot confuse the policies one should have for rockets with the policies one should have for toasters.

I would like to highlight six trends that I believe are occurring that significantly affect the defense industrial base insofar as it relates to trade matters.

The first of these trends I would cite is that, in my judgment, the defense industrial base in this country is weakening. We are seeing layoffs, we are seeing mergers, we are seeing takeovers. The stock of the aerospace industry today sells at about a 35-percent discount to the market. This is important, incidentally, not only to the shareholders, but it is also very important to the ability of those firms to borrow money and invest in productivity and research and development.

The defense industry today is borrowing more than it has been in the past. This is causing some cutbacks in capital investment and in research and development.

The CSIS study, which we just heard about, shows that the number of firms doing contract work for the Department of Defense has dropped from 138,000 down to 38,000 in the past half a dozen years, a period during which defense budgets have increased by nearly 60 percent in real terms.

A second point that I would like to raise for the committee has to do with the growing coupling of the commercial marketplace with the defense industrial base in this country. Some years ago it was perhaps true that our defense capacity depended, in terms of equipment, very heavily on an arsenal system that was somewhat independent and self-sufficient for producing rifles, bombs, and so on.

Today it is the commercial state-of-the-art in many areas that really determines the capability of our defense systems. I know of no better example than the semiconductor industry, where I think few people would claim that the Defense Department is pushing the leading edge of the state-of-the-art. Rather DOD is very dependent upon the success of U.S. firms in the commercial marketplace. If U.S. firms are unable to compete commercially, it directly impacts our ability to provide defense systems.

Those same commercial firms, if they are viable, provide an important mobilization base for defense: the auto industry, shipbuilding, semiconductors, aerospace, and many others, fall under that category.

It should be obvious, therefore, that if we cannot compete commercially in this country and thereby grow our gross national product, we will not be able to afford adequate defense. In my judgment, that is a part of the reason why we see the Soviet military supporting the new initiatives in the Soviet Union, glasnost in particular. They have discovered that even if they continue spending some 17 percent of their gross national product on defense, if the gross national product is going nowhere, it is going to be hard to provide the kind of defense that they would like to have.

Third, I think we need to recognize that we cannot be self-sufficient in everything that relates to defense. On the other hand, my personal belief is that we must be self-sufficient in some things that relate to defense. The principal problem occurs at the lower tiers, not at the prime contractor, such as at my firm, but at the suppliers of electronic components, optical components, and fasteners for example. They are the ones that tend to suffer the most. One reason for that is the great emphasis which has been placed on pure price competition in defense procurement. That has caused prime contractors to buy overseas even when they believe it is not in the best interest of the Nation. It is often the best way to get the lowest price.

The items that I believe we need to assure that we can provide ourselves independently have certain properties. I think they are the kinds of things where know-how is very key, where the question exists of whether you can even build it if you cannot obtain it from abroad. That tends to be items that have very high technology incorporated, where the change in the state-of-the-art is pacing new product developments.

I believe we need to be self-sufficient in important items with very long lead times for the obvious reasons. Similarly, items that have a critical impact on deterrence or on war fighting. In that category, certainly strategic systems should not have significant dependency from abroad.

I believe we should be self-sufficient in items that are not suitable for stockpiling, either because they have a high cost or because they are perishable. In this case perishability very likely includes technological perishability.

I would like to, in the category of self-sufficiency, cite one area that I believe has received relatively little coordinated attention to date in this country, I think will become of growing importance. We still have an opportunity to be sure that we have a rational policy and are not forced to deal with problems one by one. The area I refer to is foreign ownership of U.S. firms that are major suppliers to the United States for meeting national defense needs.

It is not really within the purview of industrial executives to prevent the sale of components of their corporations that do business in defense to foreign purchasers. By and large, the laws require that we sell in the interest of our stockholders, which usually means the highest price. Therefore, when we put a piece of our business on the market, if a foreign purchaser offers the largest amount of money, chances are the sale will go to that high bidder.

In many cases that may not be in the best interest of the country, although it might be in the short-term interest of the company. I believe that this is an area where government will need to be very vigilant.

The fourth area I wanted to touch upon has to deal with the increasing globalization of commerce. In today's world, geopolitical boundaries and market boundaries no longer coincide. As a result of this, no one Nation can unilaterally impose its market rules on the market place as a whole. This is, and in my opinion, the root problem of the trading difficulties our Nation has, both commercially and in defense.

Our trading partners have, within this marketplace, set up strategies that work. The United States has been handicapped by a very short-term perspective from people who run our industries and by adversarialism between our Government and our industry, particularly in the area of defense.

The fifth area has to do with the fact that much of the damage to the defense industrial base has been done at our own hands. This differs, in my opinion, from the damage that has been done to our commercial industrial base. The latter, I think, has suffered mainly from the lack of sufficient emphasis on the importance of quality, a very short-term focus of our industrial executives; and the extreme success of foreign targeting strategies, where foreign governments and industries have targeted certain U.S. markets.

In the defense industrial base case, however, the problems really are created right here at home, by and large. They include such things as fixed-price development contracts, excessive oversight, turbulence in the acquisition system and criminalization of the procurement process, which leads to check upon check in our firms and cost upon cost.

The final trend, and perhaps the most important that I would like to discuss in terms of the health of the defense industrial base relates to the people who manage that system for our Government. I am deeply concerned at the rate at which talented career civil servants are leaving our Government at this point in time. At no time in my life have I seen so many talented people leave as in the last 3 months.

Our Government, I think, has been blessed with some very talented people to manage the defense industrial base. I worked alongside them for 10 years of my life. They are very dedicated people. But I am also convinced that management can be no stronger than the people who manage. And the trends, in terms of Government personnel policies, I think, if not changed, are likely to be more damaging to the defense industrial base than anything we in industry could do.

And Mr. Chairman and members of the committee, that completes my remarks. Thank you for the opportunity to testify. I, of course, welcome your questions.

[The prepared statement of Mr. Augustine follows:]

STATEMENT BY
MR. NORMAN R. AUGUSTINE
CHAIRMAN AND CHIEF EXECUTIVE OFFICER
MARTIN MARIETTA CORPORATION

Good Morning Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to appear before you to discuss the implications of foreign dependency on the defense industrial base. I have been involved with this issue both as Chairman and CEO of Martin Marietta as well as Chairman of the Defense Policy Advisory Committee on Trade (DPACT), a group of approximately 35 CEO's and senior Executives in the defense industry who advise the Secretary of Defense and U.S. Trade Representative on policy issues affecting defense trade and the U.S. defense industrial base.

Last November, the DPACT prepared a report for the incoming administration which outlined U.S. government policy options affecting defense trade and the U.S. industrial base. Most of the issues and recommendations in that report were directly aimed at maintaining a healthy and competitive U.S. defense industry in an increasingly globalized marketplace. I believe the Department of Defense has provided your committee with copies of that report. I should like to emphasize that the views I express today are my own and while generally reflective of the positions of the DPACT may not be representative in all respects of those held by a consensus of DPACT members.

Although the major topic I have been asked to address is foreign dependency, I believe a more appropriate title might be the globalization of the defense industry. Industrial globalization is forcing us to rethink traditional concepts of the defense industrial base. Several recent studies on the subject have concluded that it would be impossible for the U.S. to establish total self-sufficiency as a practical goal. Instead, we need to define the role of the U.S. vis-a-vis our allies and other friendly countries, not only in terms of collective security, but also in terms of our collective capacity to produce. The role of technology, and the need to maintain technical leadership in certain critical defense related areas, also needs more policy focus. This is particularly true as the defense industry becomes increasingly dependent on commercially developed technology, or for industries which do not have a strong U.S. production base.

One very important issue that needs more attention is the relationship between a strong U.S. economy and a strong national security. This is particularly true in today's world where interdependent global economic ties are essential to maintain a strong economy. Such global interdependency, when coupled with economic strength, provides a powerful means for influencing our allies and adversaries. Any course of action for maintaining our defense industrial base needs to be carefully evaluated with respect to its overall effect on the economy, and on the relationships between the U.S. and its allies.

An issue that often gets overlooked in discussions concerning foreign dependency and the defense industrial base is the importance of defense exports. All too often we only look at imports and focus on policies which attempt to slow the rate of imports into the U.S. However, the only true test of U.S. industrial competitiveness is in the global marketplace. Furthermore, defense exports provide a built in surge capacity for defense at an overall savings to the U.S. taxpayer. In 1987, the DoD procured a total of approximately $78 billion of equipment and services. If you subtract out the $4 billion of imports, then DoD purchased approximately $74 billion from U.S. defense suppliers. Add to this the $9 billion in defense exports and you get a U.S. defense production base of approximately $83 billion, of which 11 percent is made up of exports. However, if strategic systems of $15 billion to $20 billion are removed from the equation, since these are not exported, then exports make up approximately 15 percent of conventional defense production capacity in this country.

The importance of defense trade to our overall defense industrial base should raise some red flags, because the U.S. has not been doing very well recently.

The most vivid example is the sale of Tornado's and other items by the British to Saudi Arabia. Over the life of the contract approximately $30 billion will go directly into the European defense industrial base which otherwise would have been spent in the U.S. Not only does this cost U.S. jobs and add to the trade deficit, it also justifies European resolve to develop their own defense systems without any U.S. content which is burdened with U.S. policy and acquisition controls. Such controls, including technology transfer restrictions, are forcing companies who want to participate as suppliers on foreign defense systems to do their R&D, in addition to their production, outside the U.S. Our policies do not adequately reflect the reality that the U.S. is not the only supplier of high performance defense systems in the world.

With respect to foreign dependency in U.S. production, we do not have very good data on how much of the $83 billion in U.S. defense production capacity is built with foreign sourced parts. A common recommendation of several recent defense industrial base studies was to begin collecting this type of data on a more systematic basis. A 1986 Machinery and Allied Products Institute (MAPI) study found that the average foreign content in U.S. manufactured products across a wide spectrum of industries was approximately 15 percent of total purchases. With Buy America restrictions, defense mobilization base restrictions and other legislated restrictions, this figure is probably much lower for the defense industry. However, assuming 15 percent as a worse case scenario, and using 60 percent of sales as a high side purchasing figure for defense contractors, then as much as $7.5 billion of the $83 billion defense production base could be made up of foreign produced parts. Again, because of the above mentioned restrictions, this figure is probably highly overinflated.

Even if we knew precisely which parts were imported and where the parts came from, there is a practical limit on what we could do through the defense procurement process to change these statistics. Defense procurement is a small part of the total production for most companies that supply defense contractors. Investment decisions are driven by much larger commercial market requirements. Still, the U.S. government already has a variety of policy options to utilize for restricting foreign purchases of items used in defense products such as the Buy America Act; mobilization base restrictions on such products as bearings, ferroalloys, silicon and watches; special legislation which restricts foreign purchases of such items as textiles, coal, typewriters, specialty metals, hand measuring tools and aircraft ejection seats; Section 232 of the trade law which allows the President to protect an industry that is critical to national security; small business set asides which must be U.S. sourced; the Defense Production Act which provides government financial and procurement guarantees for certain newly established facilities.

Most of these restrictions do not apply to all situations. Nevertheless, the list of remedies is long. In fact, an argument could be made that the list of restrictions and types of remedies need considerable streamlining. The fear in making such a recommendation is that the list may only become longer. Everybody's industry is important when it is in trouble, and the national security industry is so diffuse that almost any industry can and often does make a case for being on the list.

Despite the existence of numerous policy options for protecting the defense industrial base, most of the protected industries remain in trouble. One reason stated above is that defense procurement is such a small part of production for most second and third tier contractors. However, the major problem with the existing laws is that they primarily address help for industries that are already in trouble. At best, these laws can buy such industries a little time to recover provided the basic structure of the industry is sound. These remedies almost always come at some economic expense to other segments of society, and seldom solve the problems facing a particular industry. If national security is clearly at stake, or if the industry can recover and contribute to future economic growth, then the cost may be justified. However, it is generally very difficult and always costly to address these types of problems after the fact. What is needed is more focus on keeping healthy industries healthy.

One troubling global trend that needs policy focus is the practice by some countries of targeting industries critical to defense and national security.

Establishing a level playing field is an overused term that means different things to different people but is nonetheless an important concept. Clearly we cannot have every government adopt policies which are identical with respect to such issues as taxation, social benefits and labor costs, or even on such broad issues as R&D policy or defense spending. Larger and very legitimate macroeconomic variables such as savings rates, government spending, interest rates and exchange rates also distort the level playing field. However, when a country selects one or more specific industries for development, subsidizes those industries to whatever extent necessary to be competitive, and establishes a worldwide strategy to gain market share at all costs, then it is impossible for a competing U.S. company in and of itself to remain competitive within the borders of the U.S. While we have trade laws in the U.S. which prohibit such targeting within the U.S., these laws need to be aggressively enforced. The new GATT round of negotiations should focus on much stronger enforcement mechanisms against such practices on a worldwide basis. Finally, the U.S. government needs to keep pressure through bilateral negotiations on those countries which engage in the practice of industrial targeting.

The best way to maintain a strong U.S. defense industrial capability is by maintaining technical leadership. Although we can never be self-sufficient in production for the reasons stated above, we can in many areas maintain a technology edge for developing and fielding the very best defense systems in the world. An argument can be made that if the U.S. is technically self-sufficient, then it already has plenty of production capacity that can be converted for defense purposes in a national emergency. Although this takes time, without the technology base, such conversion would not even be possible in principle.

A key concern whether or not we can maintain a strong technical base for critical components if the major source of production is not in the U.S. Here again, we should resist the temptation to build a technology wall around the U.S. to protect what we have from the rest of the world. The U.S. is not the sole repository of all technology. We need to work closely with other friendly developed countries to help advance our own state of the art. We also need proactive policies in this country which encourage investment in technology and provide a highly skilled technical workforce. The U.S. cannot keep ahead by denying technology to the rest of the world. It can only keep ahead by outperforming the rest of the world. This is particularly true in today's world of rapidly changing technology. A two to five year lead in most technical disciplines is very significant.

An issue closely related to technical self-sufficiency is foreign ownership of U.S. high technology companies. In a preliminary examination of this issue by the DPACT, the members concluded that their concerns were not related to production. In fact, there was a general belief that foreign owners may often infuse needed capital into a U.S. production facility in order to serve the U.S. market whereas a U.S. owner may be more inclined to rationalize the production with its other U.S. facilities. In the long term, as corporations become more globally interdependent, such rationalization will most likely be done on a global basis regardless of the nationality of the owner.

The source of technology, however, deserves a closer examination to determine how national security may be affected. Next generation products manufactured in foreign owned U.S. facilities may well be based primarily on foreign developed technology. While we have laws that prohibit the unlawful flow of technology developed in the U.S. to other countries, the parent corporation still controls the investment in resources for future technical developments. Over a period of time R&D centers can be shut down, people transferred and research centralized in a foreign facility. As long as no U.S. developed technology is transferred without a license, this is all perfectly legal.

Having raised the foreign ownership alarm, however, there is no conclusive evidence thus far to verify that foreign owners may be stripping a U.S. company's technical capability. No one monitors foreign owned U.S. companies to determine how well they are doing technically vis-a-vis the rest of the industry. In fact, some individuals argue that large U.S. owned multinationals have already lost their national identity to such an extent that decisions they make on technical investments may affect U.S. national security interests as much, or even more, than decisions made by foreign owned multinationals with extensive U.S. holdings. Thus we have come full circle to the opening statement that the real issue is not foreign dependency, but globalization. If we accept the fact that industry will become increasingly globalized, then the only way we can really deal with industry from a national security perspective in the long term is to insure that the U.S. economy is a more attractive place in which to invest in facilities and technology, and from which to establish a viable base for exporting, than other countries.

Keeping healthy industries healthy, and providing a positive climate in the U.S. for technical investment, facility modernization and exporting were the major themes of the November DPACT report to which I referred. The report is divided into two sections. The first section deals primarily with enhancing the U.S. defense industry's strength through competitiveness in global markets. The report identifies and discusses those issues which the U.S. can address on a unilateral basis to enhance industry's ability to compete and those issues which can only be dealt with multilaterally. The second section of the report deals primarily with strengthening the U.S. industrial base. This section is divided into issues concerning the globalization of the defense industry and maintaining technical leadership and economic competitiveness. The report is presented as a series of issue papers which suggest broad outlines rather than the specifics of a more coherent long term defense trade and industrial base policy. The report is intended to serve as a blueprint for achieving consensus on the nature of the issues and a general approach to addressing solutions. This, in turn, will serve to promote a regular dialogue between industry and the government on these issues as the specifics of implementation are formulated.

The DPACT recommendations fall into three categories: the need for new policy where there currently is no clearly stated, agreed upon policy, or where global conditions have changed sufficiently to warrant a reexamination of current policy; the need for better organizational communication and coordination to consistently implement agreed upon policy; and, the development of appropriate tools and resources to assist in implementation. The recommendations are consistent with other recent defense industrial base studies including DoD's July 1988 study entitled "Bolstering Defense Industry Competitiveness," the September 1988 study published by the Aerospace Education Foundation entitled "Lifeline In Danger," the October 1988 Defense Science Board study, and most recently, the CSIS study just published this month. The major difference between these studies and the DPACT report is the emphasis DPACT puts on the linkage between defense trade and the defense industrial base, and the corresponding recommendations for improving the U.S. defense industry's trade posture.

Although your committee already has copies of the DPACT report, I would like to briefly summarize the major recommendations.

Defense Trade Policy - The U.S. needs to establish a new defense trade policy which includes economic and industrial considerations in addition to foreign policy and national security factors, particularly given the increasing competitiveness from foreign suppliers for defense exports.

Technology Transfer - The U.S. needs to develop a coherent policy for technology transfer to allied and friendly nations. Such a policy should give much greater emphasis to foreign availability of similar technologies and liberalize third country transfer restrictions.

Organizational Coordination - The roles of the various agencies both on an inter- and intra-agency basis need to be clarified with respect to defense trade and arms transfer issues.

Export Licensing - The process of approvals for transfer of defense goods and technologies needs to be streamlined and simplified, with adequate resources made available to support the process.

Trade Negotiations - More focus needs to be given to defense issues in bilateral and multilateral trade negotiations, particularly with respect to reducing offset demands, industrial targeting and the consequences of European unification.

Global Interdependency - The U.S. government should develop a defense industrial base policy which recognizes the realities of global interdependency, encourages a fair and open trading environment, limits the use of protectionism, provides for enforcement of trading agreements, and recognizes the importance of maintaining a strong technology base.

Technical Leadership - DoD should encourage technical leadership in the defense industry by: providing adequate IR&D funding; maintaining the independence of IR&D spending; improving communication of critical planning data between DoD and industry; encouraging greater procurement of commercial items; emphasizing technology and past performance in addition to cost in competitive acquisitions; working with industry to improve the U.S. climate in technical education; insuring private technical data rights are adequately protected.

Economic Competitiveness - The U.S. government should give priority attention to developing an integrated financing policy and plan which incorporates defense industrial base considerations.

Industry Relations - Improve the environment for government-industry cooperation through increased focus on self-governance programs and clarification of ambiguous regulations which may lead to unjustified allegations of fraud.

I would like to commend the subcommittee for focusing on the very important topic of foreign dependency and its possible effect on national security. We need a strong national defense capability. As a nation we can afford strong defense. The only question becomes how much defense is necessary and what will it cost. Part of a strong defense must include the maintenance of a capable defense industry. This includes not only a capability to design, develop and produce primary defense systems, but also the capability to draw upon the best technology and products available from subtier contractors.

We are fortunate to have between the U.S. and its major allies the best industrial capability in the world. Through continued collaboration with each other we can insure that our collective industrial capability remains second to none. However, which capabilities must continue to reside solely within the U.S. for our own national security purposes is not entirely clear. This is not due to a lack of existing government policy options to identify and control such capabilities. In fact, government decisions have already been made on several items which are considered so critical that they should be procured only from U.S. sources. One could argue with the criteria that was used to develop the list, or with the methodology, but no one can dispute that at least the rudiments of such mechanisms are already in place.

The ability of the U.S. defense industry to meet U.S. defense requirements has been hindered by internal acquisition policies and a proliferation of procurement regulations. These same regulations have made it more difficult for U.S. defense contractors to compete in worldwide markets against foreign companies who receive the full support of their governments. Most of these policies and regulations were well intentioned at the time they were instituted, but they focused on solving one specific problem without an assessment of their long term affect on the capability of the defense industry.

We have all heard the expression that sometimes the cure is worse than the disease. If I were to leave any advice it would be to move with extreme caution as more focus is put on providing additional remedies to cure defense industrial base problems. It was not very long ago that we heard a similar cry about technology leakage to Eastern Bloc countries. Our cure at the time was a beefed up technology transfer control process armed with a new list of critical military technologies. Less than a decade later we have several studies, the best known being the 1987 National Academy of Sciences study headed by General Lew Allen, concluding that the system has crippled high tech U.S. trade, particularly for those items readily available from foreign suppliers.

The solution to our problems is in general not to protect, or control, except in rare circumstances. Rather, the focus should be on encouraging investment, encouraging technology, encouraging trade and keeping healthy industries healthy.

That concludes my testimony. Thank you for inviting me to appear as a witness. I will be happy to answer any questions you may have.

Senator BINGAMAN. Thank you very much.
I will start with a few questions.

CONCURRENT ENGINEERING

The issue of concurrent engineering that was referred to; I would like to ask the same question here that I asked the earlier panel, and that is whether or not Mr. Branscomb is right; do we need to change the 1986 Procurement Act requirement of separate contract competitions for R&D and for production? Is that an issue, Mr. Murrin, that you have looked at? You are advocating that we promote or incentivize concurrent engineering in the defense sector. Are there some law changes we need to try to accomplish here in the Congress in order to make that happen, or do you think it is permissible under existing law?

Mr. MURRIN. Well, Mr. Chairman, my honest answer is I am not completely sure yet. We are finding that there are a series of regulatory procedures that we have been practicing that do serve as deterrents away from concurrent engineering. But happily we are also finding that quite a few contractors, with the full concurrence of the involved DOD personnel, are finding legitimate and proper ways to adapt the system so that concurrent engineering can be effectively practiced.

A principal problem we have is that we have, starting back in engineering, trained many of our scientists, and engineers particularly, to be what is often called "rigid specialists", they have expertise in computer technology or in certain branches of electronics or mechanical engineering, and it does not come easily to them to participate in a team-like effort to exchange know-how, to make tradeoffs, and to concurrently do what is involved here, specify the design and the manufacturing process.

We have also, unfortunately, in most of our organizations, got ourselves organized into very disparate "fiefdoms", such that the communications between these different functions is very difficult. My own view is that those challenges, which we can indeed overcome, are much more important at the moment as we get into this farther, if there are promising changes in the laws, we will certainly bring those to your attention.

Senator BINGAMAN. Let me just say as a general matter for all three witnesses, we hope that if there are specific legislative changes that you think are important to try to accomplish this year, that before we go to mark-up next month we could see whatever you could recommend in that respect on any of the recommendations that you have made.

One other suggestion was made yesterday by Professor Branscomb which I thought was interesting. I would like to ask Mr. Fuhrman and Mr. Augustine if they would comment on it. He recommended that we adopt NASA's policy of encouraging defense contractors to commercialize technologies developed with the IR&D and SBIR funds, rather than discouraging, and in some cases, actually punishing them for commercializing those technologies.

Is that something that needs to be considered as a legislative matter, or is it just a change of policy within the DOD that is needed, or maybe you just disagree with the recommendation?

Mr. Fuhrman.

Mr. FUHRMAN. Let me just say that I do not see that as a major issue; at least we have not come across it as an issue. We think we handle it the same, whether it is in NASA programs or DOD programs. I guess there could be cases where, by regulation perhaps, some parts of DOD are discouraged from this, but I have not run up against them personally.

Senator BINGAMAN. OK.

Mr. Augustine, are you familiar with this problem, or is there a problem there?

Mr. AUGUSTINE. Mr. Chairman, up until, I think about 1972, the policy was to encourage the type of exchange that Dr. Branscomb suggests. In about 1972 the policy was reversed. I believe we would be well served to go back to the earlier practice. But I would also have to agree with Mr. Furhman, that I do not believe this is a major factor in terms of impacting either the commercial industrial base or the defense industrial base.

Senator BINGAMAN. OK.

MILSPEC STANDARDS

One of the other suggestions was of a full-scale review of MILSPEC standards in order to achieve compatibility between the MILSPECs and commercial engineering standards. How important is that? And what is needed in the way of a mechanism to accomplish it? On the previous panel, I gathered that there was general agreement that it was a good idea, but that there is not a great deal of resources and commitment to accomplish it.

Mr. Murrin.

Mr. MURRIN. Well, as you well know, Dick Donnelly commented on this a little bit ago. And one of the encouraging areas where great progress has been made already is to increasingly use commercial integrated circuits. That is starting to a significant degree, and holds promise of becoming much more extensive and beneficial.

An area that our Defense Manufacturing Board is concentrating on is soldering. That seems like a very mundane practice. We solder countless joints each year. When you look closely at the cost of doing that and the importance to the performance and reliability of the equipment involved, it turns out to be very, very important and very challenging.

During one of our field trips, we were hosted by Motorola's Government systems operation near Phoenix, where they toured us through the activities which are following the countless "How-to" soldering specifications imposed on them by the Department of Defense. And then they very eloquently explained that those how-to specifications are preventing them from practicing soldering procedures which would be much less costly and produce much more reliable products.

So happily there is a major effort underway in OSD and the services to examine this matter of soldering, and hopefully eliminate the how-to specifications and move aggressively, and ideally, completely toward commercial practices.

I think those are two encouraging specifics, Mr. Chairman. And if they both prove successful, and apparently they will, this might serve to expedite the overall change toward more commercial practices.

Senator BINGAMAN. Mr. Fuhrman.

Mr. FUHRMAN. I would like to add just a little bit to that. You talked earlier about the Defense Science Board study that was going on. I had a chance to review the status of that a few weeks ago. I think in the semiconductor area, as Mr. Murrin says, they have made great progress. The services are picking it up and I think are moving out. And I think acceptance of commercial practices is now almost across the board.

They are now going to extend this, in the DSB study at least, to computers and software, because it is a natural extension. And this is an area I think where there could be great gains.

I think we have to accept the fact, though, that the system needs to do these things somewhat slowly. You cannot just throw out everything and start over. But I do think there is recognition now in DOD in general that we should tailor specifications.

If you can get at it early in the up-front part of a program, you can get across the idea of letting us tailor the specifications to the real needs. And that is really what we are talking about here.

And it is going to take time, but I think the support from this committee in this area is good, and I think continuing activity, like the sort of thing that is going on in the Defense Manufacturing Board and the DSB is also going to help.

Senator BINGAMAN. Mr. Augustine, did you have a comment on that?

Mr. AUGUSTINE. I would like to comment on that.

One of the difficulties with the specifications is that there are these indentured sets of specifications; and so when one calls out what one might believe to be a rather straightforward specification, it has a flow-down effect that may be imposing literally thousands of specs. And that does, indeed, increase the price of the products the Department of Defense buys.

I would like, though, to take the other side of the argument a little bit and say that the specifications serve an important purpose to the Government in terms of what they buy. If you will permit me to use a rather frivolous example, it makes the point.

Some years ago the Washington Post ran on the front page at Christmastime for about a week the specification of the U.S. Army for fruitcake. With a great deal of humor, it was pointed out at how ridiculous it was to have a 10-page specification for fruitcake. I got to thinking in my own company, if we wanted to have some of that, I would go to our procurement person and say go buy some fruitcake for a Christmas party and do a good job.

Well, the Government is in a position of really having to do business with almost anyone that has an oven and comes in and wants to sell. So I got to thinking, how would I deal with that differently? You soon say, well, if anybody that shows up can sell to you, and if you want there to be any cherries in the soldiers' fruitcakes, you better say how many cherries there are per cubic inch. Then you think of nuts. As you go through your list, pretty soon you have written a 10-page specification.

So my whole point is that there is a reason for this. The Government, because it does really have to do business with any quasi-legitimate offer has to be awfully precise in what it wants. That is the reason we get these specifications.

The hazard is not that we specify for each item in great detail, which I think the Government perhaps has to do in terms of function; I think the hazard is that the Government not only tells what it wants, but it tells how to get it; and furthermore, gets caught in these indentured specifications where it does not even realize what it is imposing.

Senator BINGAMAN. Or you can solve part of the problem with a 10-page spec by granting some discretion to the contracting officer in determinations of quality, I would guess.

Mr. AUGUSTINE. You are absolutely right, as we do in commercial practice.

Senator BINGAMAN. Senator Wallop.

Senator WALLOP. I am just going to say I sense that you and Mr. Murrin are exactly on the same wavelength; what you are asking for is a performance specification rather than a manufacturing specification.

Mr. AUGUSTINE. Yes, sir.

Senator WALLOP. You give me something that has a certain level of strength and can stand certain stresses or what have you, and I do not care how you solder it to get there, so long as it lasts as long as it is supposed to and has the strength that is supposed to be required. I think that goes back to my questions with Mr. Donnelly and Dr. Blackwell.

I was happy to hear you say one thing, and that is both the situation regarding personnel requirements and personnel standards that are taking place now, where we have determined in effect, that there is no integrity amongst the people that either work outside the Government looking in or inside the Government looking out. It is totally degrading, for one thing, to have to certify your innocence before you begin to do business.

The second thing, it seems to me that what you are going to do is sentence people to life in Government service or life in civilian service, and all that rich cross-fertilization which can come from it is lost to the country. And all on a mistaken sense that integrity can be legislated by a certain set of sequential rules and requirements.

I guess I come from an old-fashioned school that says if a guy is essentially dishonest, there is no set of standards by which you can evade that dishonesty or prevent it from taking place. But there is every sense of reason to believe that such a set of requirements prevents both integrity, competence, and efficiency in the performance of the good people's duties.

So I just hope that we in Congress get around to the idea that there is an assumption of innocence with a real set of punishment when you have found wrongdoing. There is a big difference in attitude.

"ILL WIND"

It brings me to something you said, Mr. Fuhrman and Mr. Augustine, speaking of the adversarial relationship between the industry and DOD and the Congress, and your statement that the defense industry, DOD counsel might have avoided some of the problems of "Ill Wind." Could you just elaborate a little?

Mr. **Fuhrman**. Well, what I was really saying is much along the line of what you are saying. We should expect honesty. We should ask for, I think, ethical standards, and we should ask for people to sign up to ethical standards. And then if they violate those, we should do what we have to do, which is act quickly and expeditiously.

And my point was I see no problem in asking everybody that deals with the Government to sign up to a code of ethics.

Senator **Wallop**. But let me just put an ethicist's twist on that. So long as the code of ethics deals with ethics and does not get into the performance end.

Mr. **Fuhrman**. Exactly. And it ought to be tailored to the situation. It ought to be what is required, for example, for a prime contractor to deal with the Government or a consultant to deal with the Government or with a prime contractor. But it seems to me we could have standards; people could sign up to those standards, and then we should expect compliance with them.

Senator **Wallop**. Again, there should be standards; I do not quarrel with that. But I am going back to service on the Senate Ethics Committee one time, and in particular, one event that dealt with the ultimate expulsion of a Member of the Senate. Where one of our leaders here saying, Senator, we are not here to determine whether or not this action was right or wrong, we are here to determine whether it was permitted under the rules. If that becomes the standard of ethics, we are lost before we start. I would just caution against it.

Let me slip quickly to something more specific.

DEFENSE EXPORT SALES

Norm, on page 2 of your statement, you mention that defense export sales provide a built-in surge capacity. However, there have been some concerns that in order to sell abroad, prime defense contractors have agreed to offset conditions, which actually serve to erode the business of lower subcontractor tiers.

Could you give us some views on this phenomenon?

Mr. AUGUSTINE. Yes, Senator. I would be happy to do that.

Certainly the point, I think, is true: that by having some foreign sales it gives us an opportunity in a surge time to divert those sales to our own military forces. We have also seen times where those sales have kept production lines alive that otherwise would have closed.

Offsets, as the committee well knows, is the practice whereby when one sells abroad, one agrees to purchase a certain amount from abroad in order to offset the foreign exchange and job loss that tends to go with that. It is a practice that is rather widely used, and sometimes is not even recognized by that name. For example, when we buy a system from abroad and insist that we build it in this country, we, in effect, are imposing an offset.

So I would profess that not all offsets are bad. I suspect that you can hardly conduct international business without them. I am confident that the United States cannot unilaterally impose a no-offset policy, because I know that would drive us out of the world market place. That, I think, would be very unfortunate.

On the other hand, offsets can really be abused, particularly when they are not offsets in kind; particularly when the offsets get to be even greater than the amount of the sale in the first place. I am sure you are familiar with at least one case where there was 120 percent offset. I do not know how that serves our country very well.

My recommendation would be that we not ban offsets, but that we try to control them at a reasonable level and that we do that through multilateral or bilateral negotiation rather than by unilateral legislation.

Senator BINGAMAN. Senator Wirth.

Senator WIRTH. Thank you, Mr. Chairman. And thank you, gentlemen, for being here; and thank you for your very useful comments and analyses. I hope we can make something happen out of all of this.

A week ago I spent the good part of an afternoon with Don Rice, who will be the new Secretary of the Air Force. I was describing to him the activities of the group of 8, 10, or 12 CEOs who had an interest in this issue that Senator Bingaman had put together last year. We sent him a copy of that report, urged him to look at it and to place it high on his priorities as the Secretary of the Air Force.

It seems to me that those kinds of issues have got to be a high priority for him before he gets involved in all of the other day-today activities that he is going to face.

He was very interested in that and wanted to know more about it. I encourage you to bring this matter up with the Secretary when you see him as I think he was very interested in this issue and wanted to know more about it. I say this because it is my experience that if you grab someone early on in a new job and get him to attend to a given problem early on, he is more likely to try to patch things up then, than 3 or 6 months later.

Let me go on, if I might. I think we are all here because we agree there ought to be some kind of a defense industrial base policy. Is not that right?

It seems to me however that Mr. Donnelly said this morning that we really do not have a defense industrial base, but have a commercial industrial base. And what you were saying as I listened to your testimony, Mr. Augustine, is that you emphasize the globalization of our activity and that we are going to have to really rethink what we have been talking about, in terms of a defense industrial base.

That suggests to me that what we are really talking about is a healthy overall economic base in the United States. This means that we ought to be thinking about a national economic policy or a national industrial policy in order to make the defense operations work. Is not that essentially what we are thinking about?

If, in fact, we are saying that we are increasingly dependent on the commercial side, we are increasingly dependent upon a global economy, in effect, what we are saying is that we have got to be attending to a fundamental economic and industrial base in the United States in order to make a defense industrial base policy possible.

Is not that right? Is not that essentially what we are saying?

Mr. AUGUSTINE. Senator Wirth, I would strongly agree with that. None of us want to see a policy where the Government runs the U.S. industry. What we need is an industrial strategy that you allude to. I think we are being divided and conquered, if you will, by foreign countries that do have an industrial strategy. And we seem to lack one today.

Mr. FUHRMAN. But what I had asked for was establishing at the executive level an industrial policy committee that could consider the interaction of these issues, which I think is really what you are saying. We need to have action from Commerce, Defense, Treasury, and the rest of the organizations so that what one is doing can be measured in what the combined effect is going to be.

Senator WIRTH. We are beyond the point of picking winners and losers; or that there was going to be some great board in the sky that was going to say "you win" and "you lose," or that we are going to pick a California company versus a Massachusetts company, or something like that. That is not the issue. The issue is looking at some fundamental technologies in the United States, looking at some fundamental industries that we must have in the United States, not only so that we may be economically self-sufficient in a global economy, but also to have a stronger defense capability.

Mr. FUHRMAN. Using one example that I brought up earlier was the maritime situation. Our maritime industry today just cannot satisfy our national policy objectives. Somebody, I think, must make a decision: Is that going to be critical to us or not?

Senator WIRTH. SEMATECH is an example of what we are talking about. Other countries are doing this sort of thing, having a pretty coherent partnership between their government and their industrial sector. It seems to me, as we look at what the Germans are doing, what the Japanese are doing, what the British are doing, and so on, that it would be incumbent upon us to join this process and be competitive worldwide.

Mr. FUHRMAN. One interesting thing we ran into last summer on our study, because we had somebody on it who was essentially full-time in Japan, Vince Cook from IBM. He was part of the globalization study group. He came across something called MITI 2000. MITI 2000 was a plan published by the Japanese about 6 months earlier, in Japanese of course, which described how they were going to, by establishing the standards, take over the computer-based telecommunications business by the year 2000.

To our knowledge, up to the time of our study, nobody had bothered to translate that study into English, let alone worry about it. It is that kind of thing that I think needs to be looked at on a broader base.

HIGH DEFINITION TELEVISION

Senator WIRTH. Could you make a comment or two about how high definition television fits into this?

Mr. MURRIN. Thank you, Senator, for the opportunity.

As touched on earlier, the issue is not the next generation of a home television set per se; the issue is really which country and which companies will win large shares of the world market for this next-generation, very sophisticated system. It is a system that reaches all the way back to the production studio; it includes various and sundry means of transmission; and then ultimately, not only into our homes, but our offices and schools; a system that will embody next-generation semiconductors, computer hardware and software technology, and world-class telecommunications capabilities.

A worst-case scenario can be made, I think credibly, that if our country does not significantly and successfully participate in the world's HDTV business, at least in our own American market, this will almost certainly be another major negative competitive factor against our semiconductor industry, our computer industry, and our telecommunications industry.

If you want to carry that out, kind of ad nauseam, to a really worst-case scenario, I think, and others who have thought about it conclude also, that if that happens, our U.S. Department of Defense will almost certainly be procuring from Japan a very high percentage of its electronics-intensive weapon systems in the future.

Now, I am afraid, sir, I find people in this town who not only do not find very much fault with that logic, but some of them do not find very much fault with that end conclusion. It really disturbs me very much. I sense it might disturb you and Senator Bingaman very much.

So this is simply to say if we do not get our act together, and the "our" being Government, industry, and in this case, labor and academe, might be involved, and whether we call it industrial policy, which I am advised is kind of a dirty word, and if I use it I am going to self-destruct, we call it instead industry-led competitiveness strategy, let us call it whatever, if we do not do that, sir, I think we are going to suffer another major deterioration in our competitiveness, in our standard of living, and in our national security.

I think it is tremendously important that we get our act together.

Senator WIRTH. Could I follow up very briefly?

Senator BINGAMAN. Certainly.

GETTING OUR ACT TOGETHER

Senator WIRTH. What do you mean by getting our act together? I would agree, and we all embrace the idea that we ought to get our act together, but does that mean that we should work very closely with the technology that the Japanese have developed and engage in joint ventures with them, or does that mean that we set a number of standards that are unique to the United States and North America in competition with what the Europeans and the Japanese are doing? Are there other options? Where do we start to get our act together?

Mr. MURRIN. Well, it is not completely clear yet, but it is, I guess, becoming clear through the procurements that DARPA has underway, as to how our relevant technology base compares to the Japanese and the Europeans. But the early indications seem to be that we are still in quite good shape in terms of the relevant technology.

What we need is a variety of changes, and it is quite a shopping list if you really want to delineate it all, relative to antitrust laws, for example; relative to our tax code, for example; relative to the motivation for additional R&D and investment, for example; relative to our cost of capital, for example.

I think, respectfully, sir, those all involve the Congress as well as the administration and others.

I do not know whether that is a credible wish list, but I can tell you, having sat for hours with American companies who are pondering whether or not to enter in a significant way HDTV, and thereby to have to commit tens, if not hundreds of millions of dollars, their view currently is that absent significant changes, in these areas and others, they are not going to be able to compete with the Japanese or the Europeans; and they probably will not initiate those undertakings.

I think, additionally, we are probably faced with a variety of consortia, thanks to Norm's efforts and others and the tremendous support you folks have provided; we have SEMATECH. You can make a case for a series of different kind of SEMATECH-similar consortia, appropriate to advance our high definition television initiative. That is now just being studied and worked out.

Earlier it was asked, should DARPA entertain proposals from the foreigners, from Sony or others, as part of their procurement. I think prudence is on the side of answering no, unless we find that the foreign know-how is so far ahead of ours that it is in our self-interest to invite them in, to a limited extent, to hopefully transfer their know-how to us.

It is really a very complex undertaking. And just speaking as a citizen from little old Pittsburgh, PA, who is visiting down here, we do seem to have some considerable difficulty in coming to agreement on what to do. And I think that is what is so heartening about the efforts of your subcommittee, that you are a stimulus to provide some leadership in this consensus-building process that we have to undergo.

Senator WIRTH. At the risk of beating this, just one more follow-up, if I might, Mr. Chairman?

If this subcommittee, or Chairman Bingaman, or I, were interested in introducing the definitive piece of legislation related to high definition television, which would go to the necessary consortia, that would go to the necessary antitrust waivers, where would we go to find that piece of legislation?

This goes in part to what Mr. Augustine was talking about earlier: the question of where that capability exists in the Federal Government and the fact that that is declining. I am not sure we are dealing with this problem, or that there is a great board in the sky somwhere that has thought this issue through.

If it is as important as it appears to be, and it comes up over and over and over and over again, HDTV, if it is as important as you are suggesting it is, Mr. Murrin, and that I think it is as well, how do we go about getting a handle on that? How do we go about finding the path through all of this?

Now, maybe this has been gone through; maybe somebody has already done that but I have not gotten wind of that.

Mr. Augustine, do you have any——

Mr. MURRIN. Let me comment, please, quickly?

I do not exactly know the mechanism for doing that, nor the content of that proposed package. I touched just on a few aspects of it. But I think clearly one of the promising initiatives that is well underway is the cooperative effort between the Department of Defense, including the Defense Manufacturing Board and DARPA, and the Department of Commerce.

One thing I did not mention in my report earlier was that the Defense Manufacturing Board brought to Washington, DC for 1 day recently, 60 experts from all over the country; indeed, a couple of very capable staffers here participated in that, to begin to come to consensus, to begin to develop a proposal to answer the very need that you so aptly identified.

That meeting, sponsored by the Department of Defense, was held in a large conference room at the Department of Commerce to demonstrate symbolically to all of the people involved that there was a new cooperative effort emerging in this regard. And if that was missed by any of the 60 visitors, after Messrs. Mosbacher and Costello greeted them, I specified that that was the reason we were together in the room. And everybody seemed not only comfortable with that, but very enthused.

So there is considerable encouragement. We are getting interagency cooperation. There is a lot of dialogue going on with the Congress, as you well know. And hopefully, in the next few weeks and months, we will come up with a credible game plan that represents our collective best thinking. I hope so.

Senator BINGAMAN. Did you wish to comment on the same question, Mr. Augustine?

Mr. AUGUSTINE. I would like to if I could, Mr. Chairman, just briefly.

Senator BINGAMAN. Go right ahead.

Mr. AUGUSTINE. I would share the view that high definition television is extremely important not just in the sense of letting us see poor programs more clearly, but in the sense that I think that high definition television is going to become the center of the household management system, if you will, in every home. Soon a television set is going to have more computing capability than today's personal computers. It is going to be tied in to the telecommunication system that will put you into the market.

So I think it is a terribly important next-generation product.

Your question: Is there a single place to go to get draft legislation, or some points that should be made? I do not know of any single place, but I would like to suggest a few of the points that I think should be made. One, is that we need to free our companies in that field of the antitrust restrictions, or more specifically, to apply the antitrust laws on a marketwide basis rather than on a geographical basis or political basis.

I think we should encourage the creation of a consortium, such as we had in the case of SEMATECH, thanks to many of the members of this committee.

Furthermore, and I will say it right out, I think the Government is going to have to subsidize the early phases of this effort. I think the Government will get its money back in taxes, time and time again.

The problem we have is that no single company in this country, in my judgment, could compete with a foreign government-backed company in any product.

Senator Wirth, you are familiar with the struggles of the U.S. launch vehicle industry, where China is selling launch vehicles for one-fourth of what we build them in this country.

Well, I have been in their factories, and I will guarantee you they do not do it through great efficiency. But there is no way U.S. companies can survive when they are targeted by foreign governments.

So that leads me to the last point I would like to make. I think our Government is going to have to be more supportive of U.S. industry. When we see signs of dumping into our market, or when U.S. firms are denied market access, I think we need to retaliate strongly. We have got to play hardball.

We have one thing really going for us that we often overlook, and that is that all those high definition televisions are going to be made somewhere; an awful lot of them are going to be sold in America. And that is the leverage we have, in my judgment, to make sure that America gets a piece of that market.

Thank you.

Senator BINGAMAN. Thank you very much.

Let me just follow up in the general area.

Mr. Murrin, in your presentation on the Defense Science Board's activities, your subcommittee on industrial base has as one of its goals the development of a defense industrial strategic plan, which I certainly commend you for. And one part of that, as you describe it here in the materials you have provided to us, is to identify critical industries.

As you may know, we asked the Department of Defense last year, in the defense authorization bill, to identify what they considered the critical technologies for our long-term national defense needs. They presented us with a report that identified 22. I do not know if you have seen a copy of that. If you have comments on that, obviously we would love to have those, either today or in the future in writing, as to whether that is useful, and whether that gives us a starting point.

What occurs to me, in reading over that plan, is that if the development and research that goes into developing the technology is significant to us, it is going to be because we also do what is necessary to nurture the industry that will be required to take that technology and apply it to a weapon system, or take that technology and apply it to some useful product that we then can use or sell.

I am just wondering what your thoughts are as to how we get from a list of critical technologies to a plan to develop them, and then to a list and plan to nurture critical industries. I see HDTV as one example of what needs to be done. It is a potentially critical industry which builds on many other critical technologies that we are now hoping we can do a better job of researching.

If you could just give me any thoughts you have as to how we get from a listing of critical technologies to an actual nurturing of industries needed to develop those technologies?

Mr. MURRIN. We have had the opportunity to dialogue with the folks who prepared that report for you. In fact, one of their very capable key people is here. And to the extent I am able to comment on it, I think it is a magnificent start toward developing the kind of broader strategic plan that I think you have in mind.

Perhaps what we need now is to think through, starting with those science-intensive priorities, how we move to the concurrent engineering phase, and adapt the techniques that we touched on earlier.

Then, additionally, if I read your comments correctly, how we provide incentives to assure the later investment in plant and equipment and marketing necessary to fully exploit those scientific initiatives.

We think our Defense Manufacturing Board can and will play a role in that; I expect increasingly the Defense Science Board also. And by the way, we are increasingly joining forces together and cooperating in more efforts. And then, largely stimulated by your enlightened and visionary views on all of this, I think over the next year or so, or less, we can come up with a total integrated proposal to you.

But it seems to be an excellent start. But we have to go through the engineering phase, and particularly the manufacturing phase and all that that implies, and I think then we can be responsive to you.

Many of our people are working at your invitation and your staff, on developing reactions and recommendations to the report.

Senator BINGAMAN. Do either of the others have a comment on this; Mr. Augustine, Mr. Fuhrman?

Mr. FUHRMAN. I would like to say a couple of things about it.

I think this is one of those areas where, to really pursue it from a DOD perspective is going to require the central management of technology that I talked about. It must be coordinated, certainly, from the OSD level. If it gets delegated to the services, perhaps by technology, that would be all right, but there must be central coordination. And then we have to see to it that we bridge the gap from development to application of the technology; how it is done in our R&D centers; how it is coordinated with industry; how you encourage industry to spend IR&D and other resources on it. And then how we bridge the gap to finally take it to production.

So it needs to be managed like a program, in effect. It cannot just be looked at as pure technology by itself. That is my main point.

Senator BINGAMAN. Mr. Augustine.

Mr. AUGUSTINE. I think the list is an excellent one. The first important step is to be sure that there are sufficient funds dedicated to those items. As the budget gets cut and the pressures grow to cut back on long-term payoffs, we need to be sure that those are adequately funded. And I think if we do that we will have gone a long way toward accomplishing the goal you cite.

Senator BINGAMAN. Senator Wirth, do you have some additional questions? Go right ahead.

HDTV

Senator WIRTH. I just had one item. I would like any suggestions from the three of you on HDTV and how we might follow up on that. I remember when we were doing SEMATECH almost 3 years ago, there were a number of people who were very interested in this. That package finally got snapped together in this committee, more than any place else; working with Mr. Noyce and company. This one is more complicated. But I think there is a similar model there.

There appear to be three tracks that we have got to pursue. One, the consortium notion, like SEMATECH. Second, some funding to help it out. And third, the antitrust piece, which in part, was something of a problem with SEMATECH, but we got around that.

It seems to me that those are the three major building blocks; and maybe this is happening someplace, but that has got to be brought together. I would think it would be this subcommittee, Jeff, that would be the logical place to do that. Maybe something is going on now to pull these together. Do you know?

Senator BINGAMAN. I think the Secretary of Commerce has been directed by the President to do this within the executive branch. I do not know how far along that effort is, but I do think it is something we need to look at and see if there is something that we can do to help move it along.

Senator WIRTH. Maybe we ought to ask him to come up or sit down and meet with him.

Senator BINGAMAN. My understanding, just informally, is that he is not yet far enough along in the process to feel very comfortable in briefing the Congress on it. I think Senator Gore had him scheduled to brief his subcommittee on the Commerce Committee yesterday, and they declined to do that at the last minute. So I think they are trying to figure out what they are going to do.

And I agree with you, we need to find out all we can from the executive branch about what is happening, and then determine whether we can do something constructive in this year's bill to help the process.

Senator **Wirth**. Maybe we can nudge them a little bit; write them a letter. I always suspect that does good if there is a little bit of push that is coming from up here.

Senator **Bingaman**. OK. I agree with that.

COMPETITIVE PROCUREMENT

Senator **Wirth**. Let me jump to a separate issue, if I might. We have heard a lot about the need for competitive procurement. And that has been one of the themes ever since I have been in the Congress: the more competition you are the better off we are. It seems to me in the 1980s, we set up a lot of parallel lines. Your company makes part of the Hellfire missile, does it not, Mr. Augustine, and there are competitors doing that. The Phoenix, the Maverick, the Navy Standard missile, all have second sources. Is not that right?

Mr. **Augustine**. All those systems do, yes.

Senator **Wirth**. And that is fine when you have increasing budgets and you are building a significant quantity, it seems to me that kind of competition may appear to work pretty well. But when the curve of money is going in the other direction, it seems to me we ought to step back and perhaps look at it in a different way; that if we maintain competitive lines, if we maintain second sources in declining budgets, maybe, in fact, we are not increasing efficiency, but dramatically decreasing efficiency by keeping a lot of inefficient lines open when we do not have the demand for what both lines can produce.

The question is: What do we do? Is this a problem? And if so, what do we do about it? Do we, effectively, say what we are going to do is, as Senator Wallop was suggesting, we have one early shootout or competition and then award that to one source and keep it going? How do you discipline that source? Is this a real problem or is this one that is of less importance than the other things we have talked about today?

Mr. **Augustine**. Mr. Chairman, Senator Wirth, I think it is an important subject. I am clearly in the camp that says that competition pays for itself and that competition is very useful in most cases. The problem we have had is that we have overly applied competition to many cases where it does not apply.

You cited a case that is very legitimate. That is the one where you have so little procurement to begin with, that to put two people in the business does not make much sense. It is a case where you do not have enough procurement to be efficient so you split it between two producers. In my book I describe that as trying to leap deep chasms in two bounds. It just does not work very well. [Laughter.]

So I think the solution to the problem you cite is, in part, to go back to the Competition in Contracting Act, emphasize that the objective is to obtain the best value for the Government, and downplay the importance of always trying to obtain the best price and to always have competition. What we want is the best value, and sometimes that entails competition. In the case you describe, I do not think it does entail competition.

Mr. **Fuhrman**. Let me support what Norm is saying, and then maybe add a point or two. First of all, I agree completely. There are certain classes of things where competition on hardware on a year-to-year basis is good. It does require, however, some stability in the procurement process. And I mean in that, therefore, in authorization and appropriations, too.

Multiyear contracting can be a great benefit because it does have the benefit that each party will make an investment to make himself efficient, to compete effectively and get the prices down.

On the contrary, of course, where you have instability, you have the opposite. Because now, nobody is going to invest to get efficient. This is going to be the case where there is lack of program stability.

I think if we look hard at what was said in Competition in Contracting Act though, however, it says competition on price alone is not the only thing. I think the DOD has misinterpreted that to a certain extent. And there must be other considerations in the competitive environment: quality, maintainability, reliability. And I think you can incent contractors in those directions, particularly in some of these lower-rate production cases, so that you do get the best value that Norm was talking about.

Mr. MURRIN. Senator, just to supplement briefly what Bob has just said regarding incentives. There will be cases, for the reasons you know well, where it is not practical to have additional competitors. It has been the experience of many contractors, and I think this really could become much more general, that if well thought out incentivized contracts are negotiated between DOD and the contractor, this can serve the same purposes.

Just to cite two quickly that I am very familiar with: the Air Force, through IMIP, a few years ago motivated Westinghouse to build, at its expense, a new electronic assembly plant down in College Station, Texas. That plant is producing very sophisticated printed wiring assemblies for fire-control radars for the F-16, for example, that now cost the Government less than half of what would have been the cost if that incentivized program was not initiated.

Similarly, under the umbrella of value engineering, but really emphasizing quality and reliability improvement, the same contractor recently earned $7 million of incentive fee for greatly increasing the mean time to failure and mean time for maintenance actions on similar sophisticated electronic equipments. The financial gains to the Air Force have been many times those incentives.

So I would urge that as we go forward, and particularly, as the budget turns down, and so forth, we consider more innovatively than we have, perhaps, the opportunities to motivate contractors to do a much better job than they typically do through financial and other incentives.

Mr. FUHRMAN. There are some really good examples out there on this, such as Tom has mentioned.

Senator BINGAMAN. Did you have some additional questions? Go ahead.

Senator WIRTH. Has this changed, to get the greatest value for the Government, is that something that has to be done legislatively or is that in the contracting directives that comes from the Secretary of Defense?

Mr. AUGUSTINE. The CICA, itself, is permissive. The major change I would recommend would be to make it clearer with respect to what is intended. But the CICA permits one to contract sensibly.

I think that many of the problems come not from the regulations the Government issues, but from the implementation. For example, the DOD puts out a goal that you will compete X percent of the dollars awarded this year. And every year X has to be bigger than the X for the previous year. That forces contracting officers to compete things that they will tell you privately, it does not make sense to compete, but they have to, to make their goal.

So I think it is the arbitrariness that is causing the problem, followed by the strong audit function. If a contracting officer does not compete something, he is terribly exposed to criticism by the auditors.

I think that legislation could make the intent clearer: that we really are after best value; we are not after percent of competition as a goal. I think that would be constructive.

UNFILLED POSITIONS IN DEPARTMENT OF DEFENSE

Senator WIRTH. And just a final quick question, if I might. This morning's Washington Post ran a story on unfilled positions in the Department of Defense because they could not get good people to take them on because compensation was not adequate for individuals, particularly with families and kids that want to go to college. And the same thing occurred, apparently, in the Department of Agriculture. And certainly we see that at NIH and elsewhere.

And this goes to your final point, Mr. Augustine, of saying that the people who manage the system for the Government are the most important of all the variables. The problem there is essentially how much money people are getting paid, the compensation for managers. Is that the fundamental problem?

Mr. AUGUSTINE. Senator Wirth, if you will permit me a minute or two to answer that, because it is such an important question.

I think we need to divide the people in two groups. One are Presidential appointees; the other are career civil servants. For career civil servants, I think the compensation is a problem. I think that the career civil servants have interpreted the Congress' decision not to grant pay increases, not just in terms of the impact it has on their pay envelope, but as saying their employer really does not care much about them. That is really the most damaging part. It is the signal.

The difficulty of managing a large and growing bureaucratic system is tough for the professional civil servant. The lack of stature that we afford our professional civil servants is a real concern. They deserve much more credit and public image than they get.

When you deal with the Presidential appointee, I do not think salary is the primary issue. Most of us can serve our country for 4 years and take the hit and figure a way to get through it. I really do not think that is a major problem.

I think the problem for Presidential appointees resides in the conflict-of-interest legislation, where a person who is not prepared to retire when they leave really is precluded from serving if the job resides in the acquisition area at all; that is the only area that I know anything about or profess to know anything about.

So I think the two categories of people have very different problems, but I do not think salary is an issue as far as the Presidential appointees go.

Senator WIRTH. Mr. Fuhrman.

Mr. FUHRMAN. I just want to support what Norm is saying, because I think it is terribly, terribly important. I talked to the lack of our ability to keep good technical people in our R&D centers. That deals directly with the civil service pay scale problem. We can solve it by civil service pay scales or we can solve it, perhaps, by making some of those R&D centers FFRPCs.

The Presidential appointment issue, I think, right now is absolutely critical. The revolving door legislation is causing a lot of people to leave Government now so they don't get caught up in it. And I think it is keeping a lot of very good people from taking appointee jobs. I have talked to too many I know on both sides: the people leaving who are looking for employment and saying I want to get out before all these new laws apply; and other people who are saying I just cannot take a job because, if I do it, I cannot go back to industry and do anything like it again.

So I think it is hurting the United States right now in this situation.

FUNDAMENTAL COMPENSATION PACKAGE

Senator WIRTH. Maybe we react to crises in the Government, and that we are seeing the one that you are describing, the Chief Justice is talking about what is going on in the court system and the problem they have there of retaining and recruiting good people to the bench even though those are lifetime appointees.

Here on the Hill, we certainly are caught up in this enormous ethics swirl, in which we are looking at symptoms rather than the two fundamental causes, which are, one, compensation; and second, campaign finance rules. We are not going to solve any of these problems, that you are talking about, Mr. Augustine, or that the Chief Justice is talking about, or much of the ethics debate at all, until we get to a fundamental compensation package that makes sense.

Perhaps if we all talk about this enough, maybe if there are enough crises of weapons systems that fall apart because managers were lousy, or corrupt justices because we could not get somebody on board. Maybe if all of these mound up you get enough of a critical mass so that we can figure a way to come up with a compensation package that will be politically acceptable.

Right now, the horrors of this are simply terrible. As you know, politically, if the 50 percent pay raise had passed, I can guarantee you that none of us would have been able to do anything in our States, or Members of the House in their districts. The only question that would have come up at town meetings and in every piece of mail and every telephone call would have been: What do you think about the 50 percent pay raise? And when are you going to rescind it?

You know we lost people in our office who just finally quit because they could not stand the abuse of the telephone calls and answering all the letters. They said I am not going to bother to do this any more. That is a further symptom of the really significant problem. I am not sure how we get through the deal.

Mr. AUGUSTINE. Senator, I think that is a case where people like ourselves at this table here ought to be helping you. It is not something that you can deal with very well.

Senator WIRTH. No, it is not.

Mr. AUGUSTINE. And some of us have got to speak out more forcefully. We did not do it.

Senator WIRTH. We have this listing of all the problems that are in effect up here. As Senator Wallop was saying, it is as if everybody on the inside looking out is fundamentally dishonest; and everybody on the outside who wants to get in is fundamentally dishonest.

And one of the fundamental problems we have to deal with is this compensation issue. I do not raise that as a question by any means, but we live with it, you live with it, we are hearing it now from the court, we see it with the whole business of managing this enormous $300 billion enterprise, which depends upon very good people to do so. We are asking them to do things that we are not equipping them to do.

Mr. AUGUSTINE. Senator Wirth, if I could put my hat on for a moment as a CEO. If my company were losing talent at the rate your organization is losing talent, I would be very, very distressed.

Senator WIRTH. Well, maybe this is another item for your group, Mr. Murrin, to look at. I know you have got a zillion things. [Laughter.]

No, I say that very seriously. I know you have got a lot of things on your plate, but if, in fact, Mr. Augustine is correct, that this is the number one issue on your list of six trends, Mr. Augustine, if this is the most important one, then I think that you are quite right: we do need help, and, unpleasant as it is, we are going to have to address it.

Mr. MURRIN. Well, if I may, sir, because this is so important, and you are so statesmanlike in this regard, two comments.

As a happy byproduct of my increased involvement with the Department of Defense, during the last 6 months particularly, I have been exposed to several of the most capable and committed people that I have ever had the opportunity to work with. And they are really bright, they are really knowledgeable, and they are really hard working.

There is no way you could keep that kind of talent in an industrial enterprise in this country for the level of compensation that they get. And I doubt that we are going to be able, as a country, to keep the brightest and the best long term, unless we somehow redress the situation.

In regard to myself, and here I might "self-destruct", I wish this stenotypist would fall asleep or something, but it is reliably rumored that I am a prospective Presidential appointee. I am 17 weeks into a process that is, in the aggregate, about the most demeaning process I have ever been exposed to. Without any criminal record, with, I think, all of the top secret and for-your-eyes-only clearances that most any American person has held for over two decades without any abuses, I have been treated, in my own self-perception, as, if I have strong tendencies toward criminal action.

I can suffer through this because I happen to be kind of a "tough-skinned" guy who has a very attractive pension from his contractor, and my wife said, "stay out of the house" anyway. But if I knew what was involved when I was asked 17 weeks ago, to start this process, I probably would not have started it.

And other people have asked me about this subject, and they have volunteered they would never start this process.

So I just confirm what I think you are hearing from my colleagues, that this is a subject of tremendous importance.

I often think if the KGB set out to orchestrate something to destroy our capabilities, they could not do anything more effective than something like this. I respectfully make that assertion.

I hope you are tolerant of this candor. I appreciate very much the opportunity.

Senator WIRTH. I have heard that for the last month. I have probably six or eight people who come in as appointees in the administration who tear their hair out over what they have been through and what they have been exposed to and how long it has taken.

Senator BINGAMAN. I appreciate the excellent questions and answers. You have been very generous with your time. We appreciate it; we will follow up with a set of questions, with more discussion. And again, I would urge that if there are specific legislative changes that you believe we need to consider this year, we would be anxious to receive them, preferably at least by the first week of June.

Thank you all very much.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JEFF BINGAMAN

GLOBAL MANUFACTURING ENVIRONMENT

Senator BINGAMAN. The world's industrial environment has changed considerably over the past 20 years and American manufacturers are experiencing fierce competition in a number of areas. In some cases our military allies are our economic competitors. How is DOD responding to this changing global environment?

Mr. DONNELLY. The global economic environment has indeed had a profound affect on American manufacturing. As other countries improve their productive capabilities, American dominance in industries can no longer be taken for granted. The affect of this competition on certain domestic industries can impact defense production. For example, fierce competition in the semiconductor and optics industries has led to foreign sourcing for many of these components critical to weapon systems. To assist the semiconductor industry, the DOD helped establish SEMATECH, a research consortium, that is exploring new manufacturing technologies. The DOD supports the consortium concept and is helping to establish a consortium for the optics industry as well. In some cases unfair trading practices have been responsible for damaging a domestic industry. This was the case with the bearing industry which had lost market share as a result of dumping by offshore suppliers. To ensure a viable domestic bearing industry, the DOD imposed a procurement restriction requiring bearings to be purchased from domestic manufacturers in most cases. In a related action, the Department of Commerce imposed anti-dumping duties on bearings imported from the offending companies.

Planning to ensure foreign dependencies are not built into weapon systems must be done early in the acquisition process. We are currently developing procedures that will allow industrial base concerns to be addressed during the early phases of weapon system acquisition. When foreign dependencies are discovered for mature systems, the authorities under the Defense Production Act have been found to be an effective way to create a domestic manufacturing capability. For example the United States is totally dependent on a foreign source for quartz fiber which is used in a variety of aerospace applications. The Defense Production Act is being used to develop a domestic manufacturing capability for this important material.

The need to maintain a competitive domestic industrial base cannot be viewed in a vacuum. We must realize that our allies can contribute to our mutual defense efforts and that the United States should be receptive to technological advances made in other countries. Last year a new Deputy Under Secretary for Industrial and International Programs was created to balance domestic manufacturing concerns with the need to maintain strong ties with our allies. The new office provides a focal point for manufacturing issues as well as a mechanism for capitalizing on international relations. Encouraged by the Nunn amendment to the 1986 Defense Authorization Act, we have embarked on a number of weapon system development projects that team United States and allied governments and industries. Such arrangements allow us to develop systems at a fraction of the cost we would otherwise have to pay.

The operative principle is balance. Measures to ensure a responsive industrial base must be taken judiciously to preclude unnecessary and counterproductive reactions from our allies.

INDUSTRIAL BASE PROGRAMS

Senator BINGAMAN. The condition of the domestic industrial base is directly related to our ability to produce the weapons and equipment needed for national defense. What initiatives does DOD have to improve the ability of the domestic manufacturing base to meet defense materiel requirements?

Mr. DONNELLY. The DOD has issued policy and undertaken a number of initiatives to ensure the domestic manufacturing base is able to meet defense requirements. Primary policy and guidance concerning the industrial base is contained in:

DOD Directive 4005.1, "Industrial Preparedness Program"
DOD Instruction 4005.3, "Industrial Preparedness Planning"
DOD Manual 4005.3-M, "Industrial Preparedness Planning Manual"
DOD Handbook 4405.3-H, "Register of Planned Emergency Producers"

In accordance with the policies and guidance, each of the Military Services and Defense Logistics Agency conducts a production base analysis annually. The purpose of these analyses is to: (1) determine the supply of critical end items and spare parts needed to satisfy surge and mobilization requirements; (2) assess the capability of the industrial base to satisfy these material requirements; (3) identify shortfalls and bottlenecks; and (4) develop remedies.

Another effort addressed the availability of materials. A report on strategic and critical materials required to support major defense programs during a national emergency was submitted to Congress in March 1988. International and domestic industrial capacities required for raw materials, special alloys and composite materials were assessed and alternatives to assure the availability of the quantities needed were considered. The report included the final option of requiring such materials to be included in the National Defense Stockpile when an unacceptable reliance on foreign suppliers would exist under the envisioned circumstances. The Secretary of Defense will provide an update of this report annually.

Policy contained in DOD Directive 5000.1, "Major and Non-Major Defense Acquisition Programs" and DOD Instruction 5000.2, "Defense Acquisition Program Procedures" require industrial base issues to be addressed during the acquisition process.

The requirement to establish an efficient manufacturing process for each weapon system is an integral part of the Full-Scale Development phase of the acquisition process and is set forth in DOD Directive 4245.6, "Defense Production Management". The production activities to be addressed at program milestone I, II, and III are enumerated in this Directive and include manufacturing technology, producibility, quality, and life-cycle costing. Producibility of the design concept including the availability of necessary manufacturing technology is explored in a program's Concept Demonstration and Validation phase. A comprehensive producibility engineering and planning effort during development is required to enter into Full-Scale Development and a production readiness review is conducted prior to each production decision. DOD Directive 4245.7, "Transition from Development to Production", requires the application of integrated engineering and manufacturing disciplines in the design of the system and in the design review process. The Directive also authorizes the publication of a transition manual to reduce production risk. The manual was recently revised to incorporate Total Quality Management principles.

Stimulating investment in manufacturing technology is a goal of the DOD and the Industrial Modernization Incentives Program (IMIP) has proven to be an effective way to encourage investments that improve productivity. For example, a recent IMIP project at the Army Engine Plant in Stratford, Connecticut, which is operated by Textron Lycoming, increased factory efficiency 50 percent, reduced scrap and rework by 85 percent, and reduced the cost of tank and helicopter engines by 30 percent.

Another initiative involves DOD participation in an Interagency Working Group to help small and medium size manufacturers obtain flexible automated manufacturing systems. A supporting task force has been formed within the DOD to identify procurements that can be linked to this form of manufacturing.

The philosophy of Total Quality Management (TQM) is vigorously being pursued because we realize that competitiveness is determined to a large extent by the quality of production. TQM is a philosophy that strives for continuous improvement. Instead of being satisfied with a product the way it is, the goal is to continually make it better. DOD has a Master Plan and associated Guidelines that provide the roadmap for overall implementation of TQM within DOD. The Master Plan contains the management infrastructure to begin the actual practice of TQM at the top levels of the DOD and flow down to subordinate levels. TQM training is being provided at the Defense Systems Management College as well as other locations around the country.

Two other ongoing programs intended to improve the efficiency and competitiveness of defense industries are Concurrent Engineering, and Computer Aided Acquisition and Logistics Support (CALS). Concurrent Engineering is a way to increase productivity by integrating product design with the manufacturing process. DOD Concurrent Engineering guidance was issued to the Services on March 9, 1989. This guidance covered all weapon system acquisitions with particular emphasis placed on selected major programs including the Advanced Tactical Fighter and the Light Attack Helicopter. The goal of the CALS program is to bring more automation to the acquisition process. One important feature of CALS involves the electronic transfer of technical data.

A major thrust for improving the acquisition process so it is responsive to defense needs places greater emphasis on the use of commercial products and practices. To facilitate the acquisition of commercial products, the DOD is revamping the standardization program. The objective is to place less reliance of military specifications and to use simplified, functional documents to support acquisitions. Two specific actions of that effort are (1) a review of all existing specifications and standards for, among other things, cancellation or replacement by non-Government standards or simplified, Commercial Item Descriptions; and (2) a prohibition against the issuance or revision of specifications in nearly 400 Federal supply classes with significant potential for commercial acquisition, unless a waiver is granted. A waiver is to be granted only in those cases where the product or process is uniquely military. So far, over 4,000 military specifications have been replaced by non-Government standards prepared by organizations like the Aerospace Industries Association, Society of Automotive Engineers, and American Society for Testing and Materials.

The DOD is working with the Office of Federal Procurement Policy on proposed legislation which will greatly reduce the differences in contracting practices between DOD and the private sector. These differences have been cited as impediments to acquiring the best products that the commercial market has to offer. The proposed legislation addresses many perceived impediments without adversely impacting such national goals as the advancement of small and disadvantaged businesses, or competition in contracting.

The Defense Science Board (DSB) is examining ways for the DOD to specify and buy commercial items. As a direct result of DSB involvement, significant progress has been made toward acquisition of commercial electronic components which is estimated to save $800 million per year. Using the same approach on other commodity areas provides an opportunity for additional savings.

Emphasis is being placed on substituting commerical products for DOD managed items and commercial substitutes have been identified for over 116,000 items. In addition, the Defense Logistics Agency (DLA) which manages approximately 70 percent of the items used by the DOD, is making progress buying commercial products by using the commercial distribution system for direct deliveries from contractors to DOD customers. Last year materiel worth over $180 million was procured and distributed in this manner. About $78 million of this amount was acquired using an electronic data exchange, a new paperless transaction process which saves time while reducing errors and costs. Some of the items that were bought in this way are film, batteries, and automotive parts.

One way to expand the use of commercial products and practices is to make greater use of Multiple Award Schedules. These schedules simplify DOD's acquisition process and make it approach, more nearly, commercial acquisition techniques. In the past year, the use of schedules has increased by approximately 20%. A test for acquiring larger dollar value, more complex items such as construction and materials handling equipment is underway.

With regard to the manufacturing process, we are developing a Qualified Manufacturers List (QML) program. Under QML, a manufacturers' production line is evaluated to ensure that it is capable of holding critical processes within established limits at specified check points, and continuoulsy maintaining that capability during production. Through this program, DOD and defense contractors will be in a position to purchase technologically advanced products from qualified producers. We are also promoting a national product certification methodology which is to be non-Government sponsored, industry supported, and Government endorsed. This system is intended to reduce our direct involvement in manufacturers' operations while enhancing U.S. industries' competitive position in the world marketplace. This program will also certify a manufacturer's capability to supply commercial products that meet the DOD's needs.

INDUSTRIAL BASE ANALYTIC CAPABILITIES

Senator BINGAMAN. Analysis is very important for assessing the ability of the domestic manufacturing base to provide the material needed for national defense. What is the DOD doing to upgrade analytic capabilities?

Mr. DONNELLY. One of the actions taken as a result of the "Bolstering Industrial Competitiveness Report" was the creation of a Defense Manufacturing Board (DMB). The industrial base subcommittee of the DMB is forming a task force on long term industrial strategies. The objective of this group is to develop and implement strategic plans for meeting the industrial and manufacturing technology needs of the DOD.

The DOD and the National Academy of Sciences (NAS) are involved in an effort to develop a manufacturing strategy on a national level. A contract was awarded to NAS and a Manufacturing Strategy Committee is being formed.

Effective analysis requires access to automated systems. DINET is an initiative to develop an information system designed to monitor significant trends affecting the responsiveness of the U.S. industrial base. Because of major changes in the base, it is important to know how these trends are affecting current and future military capabilities especially the impact of foreign competition and foreign sourcing. DINET captures information from a number of sources and can show contractual information for contracts exceeding $25,000, alternate suppliers, and corporate profiles. Data can be arrayed by weapon system, federal supply class, geographic location, contractor, and several other ways.

The SOCRATES project is an initiative designed to enable the DOD to perform technology strategic planning. This type of planning examines worldwide technology and is used to augment U.S. research and development efforts and provide more effective export control. SOCRATES provides the technology strategic planner with the current status of worldwide technological capabilities, forecasts of future worldwide technological capabilities, and interrelationships among technologies.

Although DINET and SOCRATES are different systems, taken together they are a powerful tool for industrial base analysis and our plan is to merge the two systems. An implementing directive has been drafted to this effect and the Under Secretary for Acquisition has requested the SOCRATES program manager to serve on a temporary detail to further explore the merger.

Another system, the Joint Industrial Mobilization Planning Process (JIMPP) was developed by the Office of the Joint Chiefs of Staff to establish base-line industrial capability goals. JIMPP consists of three modules—a requirements module, a macro-module that provides data on 236 industrial sectors, and a micro-module that provides data on individual producers.

The 1989 Authorization Act contains analytic requirements that apply to a number of offices under the Under Secretary for Acquisition. Therefore, the Under Secretary for Acquisition is responsible for ensuring compliance with the requirements of the Act.

ADDRESSING INDUSTRIAL BASE ISSUES IN THE ACQUISITION PROCESS

Senator BINGAMAN. Effective planning requires industrial base issues to be addressed early in the acquisition cycle. What is the DOD doing to integrate industrial preparedness into the weapon program acquisition process?

Mr. Donnelly. We have a number of activities underway. A primary one is the development of a detailed industrial base analysis by each of the military departments for one major acquisition program in development, as required by the 1989 Defense Authorization Act and discussed in my testimony. We are working with the military departments to coordinate the selection of the systems, and will develop methodologies and reporting formats to assure the most useful product from these tests. The Act identifies a number of specific factors that may be considered in the performance of these analyses. These include determining the availability of essential raw materials, special alloys and composite materials for the individual systems analyzed. Other factors to be considered include the availability of essential components, subsystems, production equipment and facilities, special tooling and production equipment and the identification of components or subsystems available solely from foreign sources. Also to be considered will be domestic source alternatives to foreign sourced items. As we perform the analyses, we will require that these factors be considered, but we also expect to look at other factors such as industrial modernization, technological competitiveness and surge and mobilization capability. Based on the lessons learned from this process, we will formulate and promulgate policies and procedures for performing such analyses on all major acquisition systems.

In the meantime, new guidance has just been published in the Federal Acquisition Regulation Supplement to provide additional emphasis on industrial base issues in the acquisition process, which reinforce guidance contained in Directive 5000.1 and instruction 5000.3. 207.103(6) and 207.105(17) increase the emphasis on industrial preparedness planning, surge and mobilization early in the acquisition process and emphasizes the accountability of the program manager for developing an industrial preparedness strategy and plan in the management of the acquisition program. To reinforce this guidance, as well as the new requirements of the Authorization Act, we are undertaking a more comprehensive effort of oversight of industrial base issues during the Defense Acquisition Board process.

Another activity that is underway is our Joint Production Base Analysis Working Group, which is a fundamental effort to review and revise the industrial preparedness program (IPP) and the resulting Production Base Analyses to meet the increased requirement for improved industrial base planning. IPP, which is governed by 4005.1 and 4005.3 mentioned elsewhere, is an orderly planning program to ensure that industry can respond to peacetime and emergency production, repair, and maintenance requirements in an effective manner. It includes the determination of requirements for increased production, repair and maintenance, the identification of capability and constraints and the development of plans and investments to meet those requirements. A major focus of the working group will be to explore how we can integrate the Joint Chiefs of Staff developed Joint Industrial Mobilization Planning Process (JIMPP) into IPP. JIMPP's major thrust is to improve our ability to relate the capability of the industrial base to warfighting requirements.

Another focus of the working group will be to examine our industrial data collection approaches. We have long recognized the need to supplement our traditional IPP data gathering, which is detailed and weapon specific. Because of the evolving nature of the domestic industrial base, we know we have to obtain a broader look at the industrial base, with a particular focus on the sub-tier base where many of the foreign sourcing issues exist. While we will be looking for ways to improve foreign source visibility in our normal IPP, DINET is a primary vehicle by which we hope to obtain greater visibility into foreign sourcing issues for existing systems. This effort, in conjunction with the three specific analyses required by the Authorization Act, should provide us with a good basis to for structuring guidance and programs to track foreign sourced items in new weapon systems.

Questions Submitted by Senator Trent Lott

NATIONAL SEA-LIFT POLICY

Senator Lott. Mr. Fuhrman, your comments on the maritime industries are consistent with a number of witnesses I have heard—General Cassidy, Commander in Chief of Transportation Command, is so concerned that he has recommended adoption of a national sea lift policy. What do you think of this idea?

Mr. Fuhrman. I would support the concept of a national sea lift policy, but only if it was one of the key elements of an overall policy dealing with the problems of defense transportation. Although the shortfall in sea lift capabilities may be the most obvious deficiency in our Defense transportation system, it is highly likely that critical shortfalls also exist in airlift and in the highway and rail transportation systems necessary to bring the weapons and supplies to the theatre of battle. I hope that Congress will pursue energetically the comprehensive questions raised about our Defense transportation system.

FS-X AGREEMENT

Senator LOTT. Mr. Augustine, you speak of a globalization of the defense industry, and we have just come through an intense debate over the codevelopment of FS-X with Japan.

What is your assessment of the FS-X agreement as originally agreed and as amended by this administration?

Mr. AUGUSTINE. My answer will be somewhat qualified. I am not personally familiar with the terms of the FS-X agreement either as originally negotiated or as amended by the administration. Therefore, my actual knowledge of the agreement is based on reports in the press and conversations with colleagues.

In general, I personally share the concern of those who do not want to provide a technical capability to the Japanese which could be used against U.S. competitors in commercial products. On the other hand, the U.S. cannot stop the technical progress of other countries by denying technology to them. The automobile industry learned this a long time ago. Furthermore, the U.S. is not the sole repository of high performance fighter aircraft technology. The Europeans have publicly stated that they would be happy to collaborate with the Japanese on the FS-X. With the perishability of technology in today's rapidly changing world, the U.S. can only stay ahead of other countries by continuing to learn from them as well as keep tabs on their progress. The best way to stay ahead is by investing adequate resources into technology, facilities, and people.

From what I have heard, the agreement is structured to both protect U.S. interests and to ensure the U.S. receives benefits from any new technical developments resulting from the FS-X program. The very nature of the program, independent of the specific structure of the agreement, should help ensure that many U.S. jobs are supported throughout the life of the program.

[Whereupon, at 12:22 p.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

WEDNESDAY, MAY 31, 1989

U.S. SENATE,
SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

ACQUISITION POLICY AGENDA

The subcommittee met, pursuant to notice, at 9:37 a.m., in room SR-253, Russell Senate Office Building, Senator Jeff Bingaman (chairman of the subcommittee) presiding.

Committee members present: Senators Bingaman and Wallop.

Committee staff members present: Andrew W. Effron, general counsel; Richard D. DeBobes, counsel; and Geary Burton, counsel.

Professional staff member present: William H. Smith.

Minority staff member present: Jonathan L. Etherton, professional staff member.

Staff assistants present: Barbara L. Braucht and Melissa A. Ramsey.

Committee members' assistants present: Edward M. McGaffigan, Jr., assistant to Senator Bingaman, Dudley L. Carlson, assistant to Senator Wilson, Jack D. Crouch II, assistant to Senator Wallop, Charles G. Pearcy, assistant to Senator Lott.

OPENING STATEMENT OF SENATOR JEFF BINGAMAN, CHAIRMAN

Senator BINGAMAN. The subcommittee will come to order.

The subcommittee meets this morning to continue the hearings on recommendations on acquisition policy and issues related to that.

At our previous hearing on May 11, we received disturbing testimony from the General Accounting Office and the DOD Inspector General about glaring deficiencies in the Department's implementation of the Packard Commission reforms and recent legislation. Little progress has been made in streamlining the acquisition decisionmaking structure, increasing the use of commercial buying practices and acquisition of nondevelopment items and improving the responsiveness of the Defense Departments regulatory reform process.

Today we will focus on specific recommendations for improvements in this acquisition process.

Our previous witnesses have noted that priority attention needs to be given to enhancing the quality of the acquisition work force.

Our first witness, Jim Woolsey, will address the specific actions that can be taken to improve the Department's ability to attract, retain and train the acquisition work force. Mr. Woolsey's outstanding reputation as a public servant and as an outstanding attorney in the public and private sectors is well known to the subcommittee. His recent experience as a member of both the Packard Commission and President Bush's Ethics Commission make him particularly well qualified to address the subject.

Our second witness will be Dr. Linda Brandt, Project Director for the study on program documentation and reporting requirements prepared by the Center for Naval Analyses. Dr. Brandt has had wide experience in policy analysis both in government service and in academia. She will testify as to CNA's recommendations for improving the quality of program status information provided to decisionmakers, including recommendations for reducing the burden of information requirements on program managers.

And our final witness will be David Graham, Assistant Director of the Strategy, Forces and Resources Division of the Institute for Defense Analyses. Dr. Graham has written extensively on government management issues, and has recently conducted an analysis of the Defense Department's implementation of the Packard Commission's proposals. As we await the administration's defense management review, it is important to assess the degree of progress and the problems that have been encountered in transforming the general recommendations of the Packard Commission into specific operating procedures.

Before we turn to Mr. Woolsey, who is our first witness, I would ask Senator Wallop if there is any opening statement he would like to make.

Senator WALLOP. Mr. Chairman, thank you. I would put my opening statement in the record and just say I welcome the witnesses, Jim Woolsey, Dr. Brandt and Dr. Graham.

I am curious as we go along to see how much was implemented and how much was implemented in such a way as to sort of justify the procedures that had been in place before the recommendations were made. It occurs to me that at least on a couple of occasions those implementations could be characterized as such as to almost guarantee that there wouldn't be a whole lot of different success or even maybe a failure just to prove that commissions probably ought to stay in the minds of people and not on the acting boards where the members use their expertise to try to improve the situation in the country.

I'll just put my statement in the record. Thank you.

[The prepared statement of Senator Wallop follows:]

PREPARED STATEMENT BY SENATOR MALCOLM WALLOP

Mr. Chairman, our witnesses today are in a position to address a cluster of important issues in the acquisition policy area. We now have two years of experience with the Packard Commission recommendations. The scope of the Commission's work was very broad and covered streamlining the acquisition management organization; improving inputs by the user community into systems design and procurement; and upgrading the professionalism of the policy makers and the rank-and-file of the defense acquisition workforce.

It is time to take stock of the implementation of these recommendations. We need as well to see the extent to which new initiatives, such as recent ethics legislation, have helped or hindered us reaching the goal of more efficient acquisition management.

The three individuals before us can help illuminate the issues we must review. Mr. James Woolsey has had a distinguished record of government service including tenure as the Under Secretary of Navy. He was one of the most influential members of the Packard Commission and has also served on the President's Commission on Federal Ethics Law Reform.

One of the fundamental principles of management embodied in recent studies has been streamlined reporting for acquisition managers. I am pleased that Dr. Linda Brandt will be presenting the results of a recent Center for Naval Analysis study on streamlining DoD-wide reporting documentation.

Finally, we are priviledged to hear from Mr. Graham from the Institute for Defense Analysis on a recent comprehensive review that that organization has completed on the implementation of the Packard Commission recommendations. Given the imminent completion of the Defense Management Review in the Department of the Defense, his is a very timely presentation.

Senator BINGAMAN. Jim Woolsey, we are very pleased to have you here and look forward to your testimony. You may go ahead.

STATEMENT OF HON. R. JAMES WOOLSEY, FORMER UNDER SECRETARY OF THE NAVY, MEMBER OF THE PRESIDENT'S BLUE RIBBON COMMISSION ON DEFENSE MANAGEMENT AND THE PRESIDENT'S COMMISSION ON FEDERAL ETHICS LAW REFORM

Mr. WOOLSEY. Thank you, Mr. Chairman, Senator Wallop. I have a seven-page prepared statement that with the committee's permission I would like to submit for the record, together with an attached letter from the time in which I was working with Judge Wilkey on the President's Commission on Federal Ethics Reform. What I will try to do here this morning, if it is all right, is just to talk briefly for 10 or 15 minutes to summarize some of these points.

Senator BINGAMAN. That will be fine, and we will include the entire statement in the record.

Mr. WOOLSEY. I think, Mr. Chairman, that the single most important set of reforms the Packard Commission recommended, and the one on which all the others depend, is the personnel reforms—being able to attract and retain able people with backgrounds in defense acquisition into defense, both as political appointees and as career civilians. We found on the Packard Commission that, although it was not perfect, there had been a number of important and positive changes made in the quality of the uniformed military working on acquisition within the last few years, but there were some decided problems both at the political appointee level and in the career ranks in terms of quality, educational background and the like.

My own judgment is frankly that most, perhaps not all, of the organizational changes that we recommended on the Packard Commission and that were passed by Congress in its simultaneous action, the Goldwater-Nichols legislation, have been made. Some beginnings have been made in some of the policy recommendations, although not nearly as many as I would like to have seen, and not as early as I would like to have seen. But the major problem is that the personnel recommendations have not been followed through.

It is not in any spirit of wanting to point a finger here that I say that. I think some of the administration's proposals in this regard have been quite sound. You and this committee have undertaken major efforts to try to make improvements in the personnel situation in the Department of Defense, and I think President Bush's ethics law package will make some further improvements.

It is in this personnel arena that I believe the major problems exist, quite simply because extraordinarily able and trained people could have made the old organizational structure work for DOD acquisition, and people who are not talented or able or experienced with respect to science, technology, and defense acquisition will certainly not be able to make even an ideal organizational and policy structure work.

So, I want to focus this morning, if I might, initially on the underlying philosophy of two aspects of defense acquisition, particularly as they relate to the personnel situation in the Department of Defense.

Defense acquisition is premised in part on there being a very full and free information exchange between the public and private sectors. It has to be this way because one doesn't know where new ideas are going to come from. Many of the best ideas may come initially from industry, or from Government labs, or from a cross-fertilization produced by discussion between people who work for the Government and people who work for industry.

It has to be that way because we're trying to solve a very different type of problem in defense acquisition than we are trying to solve in much of the rest of the Government. We are essentially continually trying to outwit someone who is trying to outwit us on the other side. It is a very different type of problem than building a dam or buying light bulbs for the Government. It requires a free exchange and cross-fertilization of ideas and a flow of information back and forth between the public and private sectors.

Second, as I say in the prepared statement, since the administration of Andrew Jackson, this country has had a revolving-door system of Government service every 4 to 8 years. It is not only people with a clearly political orientation or background that change roles in the executive branch when administrations come and go, it's comptrollers and manpower experts and many, many others as well.

We do not have to have a revolving-door system in which people come and go from private life. We have done so presumably because, since the Jackson administration, we thought there were some advantages to it in terms of bringing able people into Government and in terms of not permitting domination of the executive branch by a career civil service.

But there are democracies that function very well with a different system. Britain is one. If we wanted to avoid having people, scientists and technical people, as well as others, come and go from Government, we could do so. We could adopt a more British style system with a well-paid career civil service. Britain in part uses knighthoods for its senior civil servants to encourage them. That option is not presumably open to us, but we could have a different system than we do.

But in the real world of late 20th century America, we have a Jacksonian revolving-door system for many of our senior Government people, and some that are not so senior, and we also have a need for a full and free interchange of information between public and private sectors, some of it within classified circles, but nonetheless open back and forth between the public and private sectors.

The Office of Federal Procurement Policy Act amendments of 1988 in my judgment are premised on a good idea—that one wants to avoid abuses, by singling out certain specific types of information, source selection sensitive information and proprietary information, which should be treated differently, which should not be part of a full and free exchange of information between the public and private sectors. Most people in the defense acquisition world recognize these two types of information, and I think, properly defined, they would be not only willing, but enthusiastic in treating them differently and in restricting access to them—even involving criminal penalties—in such a way as to ensure high ethical standards, so that no one profits improperly from using any of that information in the wrong way.

Those amendments also in section 6, the procurement integrity section, essentially imposed post-Government employment limitations on people who work for the Government with an eye toward restricting their use of those types of information. As a general proposition, I think that those amendments have something to be said for them.

I would call your attention to the nine page letter I wrote Judge Wilkey as a member of the Ethics Commission he chaired back in February in which, although I am rather critical of a number of aspects of section 6 of the Office of Federal Procurement Policy amendments, I do make an effort to use that underlying idea as a model for an amendment to the ethics law. There is a short draft statute attached to the letter.

The problem, in my judgment, is that by pushing its central idea so far, section 6 essentially puts us into a situation in which it is extraordinarily difficult to manage a reasonable personnel system in the Government, particularly for scientific and technical people, given these two underlying premises of our current acquisition system that I described—the need for a full and free exchange of information and the fact that we do have a Jacksonian revolving door.

Perhaps the best way I could put it is by an analogy to two of the tragedies in the Persian Gulf within the recent years, the *Stark* and the *Vincennes*. One of the few things I remember from my statistics course in college is that there are a couple of types of errors, type one and type two errors. I frankly forget which is which, but one is missing a real occurrence, such as letting a true target through a defensive screen, essentially what the *Stark* did; and the other is predicting something that does not occur, such as shooting at a false target, the error that the *Vincennes* made.

Now, we all hope to have perfect systems that make no mistakes, and we do our best, whether we are talking about the criminal justice system or radars, to make things work that way. But in the real world one often has to choose which set of mistakes to be easiest on and which to be toughest on, type one or type two errors, *Stark* errors or *Vincennes* errors. We adjust radars, and rules of engagement, and the criminal justice system from time to time to tilt them one way or the other.

In my judgment section 6, as it is presently drafted, shifts the law so heavily in the direction of ensuring that no information is transmitted improperly and that no Government official profits improperly from his Government service that it makes the system of attracting and retaining able and experienced scientific and technical people in the Government almost impossible to manage.

I have set out in an outline on pages 6 and 7 of my prepared statement some of the types of proposed changes in statutory and regulatory language that I believe would be necessary in order to have a section 6 that functions in a workable manner. I fully admit that this somewhat hastily compiled list is far from complete or precise, and I have concentrated really only on those portions of section 6 that create particular difficulties for attracting and retaining able scientific and technical people in the Government.

Without these types of changes, or something close to them—and some of them can be made by regulatory language, although I think several would have to be made by statute—I think that on July 16 one is going to turn the executive branch into an institution for which it is so unattractive for scientific, technical and skilled acquisition people to work that we will be on the edge of being reduced to having such things as defense acquisition managed by the independently wealthy, those who have completely unrelated professions at which they can learn a living after they leave, such as novelists, and the truly retired. And by that I mean not only people who have retired from their first career, but those who have, say, retired from their second.

I don't believe that the changes of the sort I have suggested here radically undercut the purpose of the statute. I think they could be made with an eye toward preserving the essence of what Congress was trying to do in section 6, but I believe the need is acute and important to get some clarifying language into that law at the earliest opportunity.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Woolsey follows:]

estimony of R. James Woolsey, Shea and Gardner

Mr Chairman, Members of the Committee. It is an honor to be invited to testify before you today on recent acquisition policy legislation. You asked that I focus on acquisition personnel issues, including those that relate to revolving door and conflict of interest matters.

I was particularly concerned with these issues as a member of the President's Commission on Federal Ethics Law Reform. I would like to submit for the Committee's review, if I might, a nine-page letter on this subject that I wrote to our Commission Chairman, Judge Wilkey, about this issue.

These questions were also very much before the Packard Commission, on which I also served. I believe it is fair to say that many of us on the Packard Commission believed that attracting able and experienced civilian managers into defense acquisition, and encouraging the ones who are there not to leave, would be the single most important defense acquisition reform -- the one on which all others depend. I have some hope, for example, that placing the responsibility for overall acquisition policy in DOD in the hands of a single official -- the Under Secretary for Acquisition -- will ultimately make some significant differences in defense acquisition. We recommended this in the Packard Commission Report and Congress established the position in the Goldwater-Nichols legislation. But establishing the position alone does nothing, and establishing it and filling it with someone who has no understanding or experience of defense acquisition would be a net negative. Only if it and other acquisition positions are filled by talented, knowledgable people will any of the Packard Commission reforms work.

It is completely inconsistent to establish, with one hand, a structure for acquisition that gives great authority to certain individuals and then, with the other, to discourage able and knowledgable individuals from serving in that structure. One would have been much better off with the old structure and with able and knowledgable people in it. The right people could have made the pre-Packard, pre-Goldwater-Nichols structure work. People who don't know what they are doing in the highly complex field of defense acquistion are not going to be made suddenly capable by being put into the new defense acquisition structure.

Two Premises of Defense Acquisition

a. Information Exchange

One premise of our system of defense acquisition is that there is to be a thorough and continuous exchange of information between the public and private sectors about the threat, new technologies, possible approaches to solving problems, etc. This exchange of information is not only permitted, it is mandated in too many places in the Federal Acquisition Regulations to count. Certainly, once a solicitation for a competitive procurement is out and a source selection process has begun, it is widely understood that it is improper for the government to disclose certain information or for competitors to obtain it from one another. But under current law and regulations these are islands of confidentiality in a sea of reasonably open communication. These open communications (sometimes within the world of classified information, to be sure) between the government and parts of the private sector are the way we, as a society, tap the talents of the country as a whole in trying to deal with threats to our national security. These threats change and require constant effort and public-private communication to deal with them because there are intelligent people designing weapons for our adversaries and potential adversaries who are continually trying to make our defense problems worse. In this way defense differs fundamentally from government tasks such as building a dam or even sending men to the moon. Defense requires this constant interaction of our best minds.

The private sector consequently does not sit quietly and wait for the government to think up the specifications for a new fighter, or surface-to-air missile, or guided projectile out of a clear blue sky. It participates vigorously in meetings, conferences, and brainstorming sessions of all sorts -- official and unofficial --with various people in the government laboratories, training commands, systems commands, Congressional staffs, and the like.

It would be possible to have less of a partnership -- for the private sector to sit mute and wait for the government to publish a solicitation for bids for a new fighter much the way it waits for a solicitation for bids for new lightbulbs. But then the fighters and the surface-to-air missiles, even with their procurement problems, wouldn't be as good as they are. And we would not be as secure.

b. Revolving Door

For over a century and a half, since the Administration of Andrew Jackson, the United States has had a revolving door system of government service -- every four or eight years. Political appointees come and go, and many non-political appointees as well, not only the cabinet and their very close political and policy advisers, but thousands of Americans, with all sorts of skills: comptrollers, managers of technology, manpower specialists, etc. We have done this, presumably, to make government more responsive to politics, to the people's will, and to provide large numbers of Americans with the opportunity to contribute their skills to government. We have done it in part, one assumes, because we think government benefits from fresh perspective.

It would be possible to have another system in a democracy. Our friends in Britain, for example, have virtually no revolving door problems because they have virtually no revolving door. In defense, career military officers and civil servants manage acquisition, for example. They are overseen by half a handful of politically-appointed ministers. In a Parliamentary system, of course, these ministers are also sitting Members of Parliament. With our divided executive and legislative branches our system could not have that feature, but we could copy Britain's approach in other regards and fill all positions except, say, the Secretary of Defense and the Service Secretaries with career people. Of course we would have to pay such people adequately and probably find other incentives as well (Britain uses knighthoods for its senior civil servants -- an option not open to us). And we would have to put up with an established civil service that essentially controlled the full work of the cabinet department and that, as has been said of Britain's, "serves all masters with equal loyalty and equal disdain."

Section 6 and the Conflict with these Premises

We have already done much to make it difficult for the government to obtain and use the skills of those who are talented and knowledgable in the field of defense acquisition -- particularly scientific and technical people -- by failing to pay them salaries commensurate with what they can make in private life. Some disparity is inevitable, particularly for senior executives, but below that level career engineers, scientists, and technical people ought to be able to earn something roughly equivalent in public life to what they can earn in private life. Otherwise we just won't have enough of them to do the government's business.

We have also deprived ourselves, in the government, of the services of large numbers of retired military personnel who have badly needed technical and managerial skills, and -- in a number of cases --distinguished scientific credentials as well. This is because, under current double-dipping legislation, most such people lose such a high proportion of their retirement pay if they continue to work for the government after retirement that they seek private employment instead. Re-thinking this sort of restriction may be essential in the near future if the federal government is to have any chance of obtaining adequate managers and specialists who are scientifically and technically trained.

But these two deterrents to government service by able and knowledgable people with scientific and technical backgrounds are about to be joined by another, on July 16, the date of effectiveness (postponed from May 16) of the Procurement Integrity section (section 6) of the Office of Federal Procurement Policy (OFPP) Act Amendments of 1988.

There are three underlying reasons why section 6 creates major problems for the recruiting and retention of talented and knowledgable scientific and technical people.

First, section 6 is, in my judgment, conceived around a sound principle: that it is particular types of information (source selection information and proprietary information) that need to be protected in the acquisition process. As I set forth in detail in my attached letter to Judge Wilkey, I think it is a much better idea to rely on that principle as a method of constraining improper post-government employment behavior than the vague, general "aid and advise" clauses that are sometimes proposed. But in several regards, section 6 creates major unnecessary problems because of the vagueness of its own language and the way its restrictions are formulated.

The problems created by section 6 in its present form derive in part, I believe, from pushing this reasonable principle to an extreme. Consequently two troublesome notions permeate major parts of the statute: one, that the amount of free interchange of information between the public and private sectors about government programs generally needs to be radically curtailed and monitored; and two, that it is possible to find an adequate supply of individuals with technical backgrounds who will work for the government even if they are essentially unemployable in their areas of specialty for two years after government service.

These two notions would be acceptable if two important aspects of the world were different. If acquisition for weapon systems could be like the acquisition of the material and services to build a dam or the acquisition of light bulbs, then we would not need continual communication between the public and private sectors about our adversaries' systems and about technical opportunities. If we had a British-style civil service system, then we would not need scientific and technical people who pass through the revolving door between the public and private sectors.

The problem is that neither of these notions comport with reality. The acquisition and personnel systems we have now could have continued to function, perhaps for the better, with careful and deliberate legislative changes designed to place certain restrictions on the communication of source selection sensitve and proprietary information and certain added restrictions on the use of that information after government service by certain officials. But in several key places the language of section 6 is so vague and potentially all-encompassing that it does something far different.

What section 6 in its present form now does may perhaps best be seen by an analogy. Statisticians talk of "type 1" and "type 2" errors. One (I forget which) is missing a real occurrence, such as detecting a true target through a defensive screen -- the error of the Stark in the Persian Gulf. The other is predicting something that does not occur, such as shooting at a false target -- the error of the Vincennes. We would all hope to have systems, whether they be radars or systems of criminal justice, that make no mistakes. But in the real world we often have to choose which set of mistakes to be easiest on. In wartime we sometimes accept, tragically, some chance of casualties from friendly fire in order to carry out a mission successfully. In peacetime we try to bias, e.g., our training the other way -- toward safety. In criminal justice we have tended to let some guilty go unpunished in order to have no, or very, very few, cases in which the innocent are punished.

What section 6, as presently drafted, does is to shift the law heavily in the direction of ensuring that no information is transmitted improperly and that no former government official profits improperly from his or her government service. It does so in such a way, however, as to shoot down many false targets -- conscientious scientific and technical people who, not wanting to come anywhere close to violating a vague law that cannot be explained to them, are voting with their feet. They are staying away from, and leaving, government service to avoid having their ethics called into question even by the standards of much of today's public commentary on these sorts of issues -- where one too often hears these complex questions dominated by the incomprehending, the impetuous, and the judgmental.

The Consequence

In my judgment this trend of able scientific and technical people leaving, and refusing to enter, government service will continue until one of two things happens -- either section 6 is repealed and perhaps replaced by two very specific restrictions in 18 U.S.C. Sec. 207 (following the report of our Commission on Federal Ethics Law Reform, President Bush proposed essentially this), or some seemingly small but very important clarifying changes are made in the statute and interpreting regulations.

What follows is a brief outline of some of the possible changes I would see as being needed in the statute and regulations, particularly from the perspective of dealing with the problem of obtaining able and knowledgable scientific and technical people for government service. I would emphasize that these suggestions constitute only a first effort on my part. With a longer time to study this issue I would certainly come up with a better list. The whole issue of section 6 should, I would suggest, be the subject of hearings in which a number of experts are heard on this important subject -- a step not taken by the Senate when the bill was passed by the Congress last year.

Possible Changes

(All section numbers refer to subsections of Sec. 27, the new section of the OFPP Act added by Sec. 6 of the 1988 amendments.)

Subsection (e):

First, clarify that "performance" of a contract does not include such work as that on independent r&d and general overhead support; if more than direct labor charges are to be included, specify precisely what constitutes "performance".

Second, clarify exactly when "negotiations" begin -- preferably with the issuance of a solicitation.

Third, make explicit that it is not all performance under the entire program from which a former government employee is barred for the two year period, but rather performance on the particular contracting action in which he participated. Many large programs have hundreds of contracting actions -- there are more than two such actions every working second in the Department of Defense. If an employee participated in one (e.g. an engine modification with one contractor) with respect to a program there is no reason to bar him, after leaving government, from being involved in the performance of another (e.g. a radar modification with another contractor).

Subsection (n):

First, redefine the period of a procurement as in section (Y)(l) of the attached letter, to begin upon the issuance of a solicitation, or at an earlier time if written notice is provided. Also, require that when material is marked "Source Selection Information" it indicate the solicitation involved. Vagueness with respect to the source selection period and the information involved in it is one of the major causes of the uncertainty produced by the current statutory language.

Second, clarify the definition of "procurement official" so it is clear that if an individual advises at one early "phase of the agency procurement" he does not become a "procurement official" with respect to all later phases. If, e.g., he advises with respect to a study contract, he does not become a "procurement official" with respect to a later solicitation for, say, a modification of the hardware.

Subsections (a) and (b):

Following the words "procurement official" in subsections (a)(1) and (b) and following "competing contractor" in subsection (b)(1) add the phrase "for such procurement". This could well have been the Congressional intent but the lack of clarity -- i.e. the lack of making it clear that these restrictions apply procurement by procurement -- is one of the sources of uncertainty about the statute's meaning. Otherwise a "procurement official" (and the definition is very broad) does not know whether or not he may accept employment from someone who is competing for a contract that is unrelated to any work he is doing.

Subsection (d):

This subsection's certification procedures raise some serious problems. Under subsection (d)(B)(ii) each of a large number of officers, employees, agents, representatives, and consultants must file a certification with the company that they are familiar with subsection (a) and that they will report any information regarding a "possible" violation of subsections (a), (b), (c), or (e). This includes, for example, the certification that no former employee is participating in the "performance" of a contract or subcontract with which he had earlier been involved. One large contractor has estimated that approximately 40,000 of its some 100,000 work force would have to file such certifications.

First, "possible" violation is so all-encompassing, employees may feel it necessary that they report, e.g., any evidence of increased family spending by a former government employee. Far preferable would be a standard such as that in the Anti-Kickback Act such as "reasonable basis to believe" that there has been a violation.

Second, there is the Constitutional question whether such a requirement by the government constitutes state action. If it does, then do contractors need to issue warnings to their employees before the latter file such certifications? If an employee fails to file, or files only a statement of his Fifth Amendment rights, may he be discharged? If he is, does he have a cause of action under state law against the contractor? Against the federal government? If an employee's certification contains a disclosure about a former government employee, and it has been filed without due notice to the employee, is the government's investigation of any wrongdoing that may be disclosed thereby tainted?

These types of problems, engendered in part by the mass nature of the certification process in the statute, might be simplified significantly by changing to a scheme of certifications from the dozen or so relatively senior employees who, in large contractors, often constitute the "business team" -- representing contract management, engineering, finance, etc. -- that will make the key recommendations on a particular procurement.

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February 13, 1989

VIA TELECOPIER

The Honorable Malcolm Richard Wilkey
Chairman
President's Commission on Federal
  Ethics Law Reform
c/o Office of the Counsel
  to the President
The White House
Washington, D.C. 20500

Dear Judge Wilkey:

In a footnote to my submission to you last week on issue 13 of the Commission's post-government employment topics, I said that I would submit a draft of a new subsection for 18 U.S.C. § 207. The draft is attached.

The outstanding issue is whether (and, if so, how) to amend § 207 to prohibit conduct by former government employees in addition to the representational conduct now prohibited by that section. In particular, the Commission has before it the questions whether to include in any proposed § 207: (1) a prohibition on "aiding and advising," such as has now been passed twice by Congress; (2) a prohibition on participating in the "performance" of a contract, such as is now included in the new § 27 of the Office of Federal Procurement Policy Act; or (3) some other restriction, such as one on the use of "inside" or "confidential" government information, such as the Commission discussed last week.

I confess that my views on this difficult set of questions were heavily influenced by the experience I had in late 1978 and early 1979. Then, as Under Secretary of the Navy, I saw the beginning of an exodus from government service of a very large number of the Navy's scientists and technically-trained officers. When Secretary Graham Claytor and I looked into the problem we learned that the phenomenon was beginning to be a general one, not only throughout the Department of Defense, but in the domestic side of government as well -- *e.g.*, research scientists at the National Institutes of Health were notifying Secretary Califano of their intent to leave. The problem was a clause in § 207(b)(ii) of the then-recently-passed Ethics-in-Government Act that was shortly to become effective. This clause prohibited not only certain representations to the government but also "aid[ing], counsel[ing], advis[ing] consult[ing], or assist[ing]" about such representations [hereinafter "aid and advise"] for a two-year period.

The uncertainty that this clause created in the minds of scientific and technical people ten years ago is admirably set out in the attached decade-old editorial from the Washington Post, titled "Thou Shalt Not -- What?" This first effort at banning post-government-employment conduct other than representational conduct was later radically circumscribed by the Congress by the addition in 1979 of the words "by personal presence" to the prohibition on aiding and advising in § 207(b)(ii). The effect was to turn the aiding and advising prohibition into another limitation on representation.

I believe that Congress acted wisely in 1979. The reason why scientists and technical people were, and are, so unwilling to serve in government if they must face a broad post-government employment restriction such as an "aid and advise" clause is that the nature of most of their activities, inside and outside government, is very different than that of many other individuals. I believe that what happens in many discussions of this issue is that lawyers and legislators (and legislator-lawyers) assume that the world of science and technology operates rather like their own and that scientists and technical people should have no trouble complying with prohibitions drafted for lawyers. Such is not the case. Let me explain.

Lawyers and Post-Employment Bans on "aiding and advising"

The reason "aid and advise" prohibitions and other similar provisions strike many lawyers and legislators as being reasonable is that they are reasonable sorts of post-government restrictions for those in the legal profession. Indeed under the bar disciplinary rules, we lawyers -- quite appropriately -- cannot leave government and "switch sides" on a particular case, even to do non-representational behind-the-scenes work such as legal research or providing advice. But the nature of legal work is such that few of us are really experts on major substantive areas of knowledge (outside, of course, knowledge of the law itself -- such as tax, or antitrust). Experts on procedure, yes, but we learn the substance of each case -- how smelters work, how boilers are designed, etc. -- as it comes along. And knowing the facts behind, *e.g.*, one Justice Department investigation is unlikely to give us much advantage in understanding the facts of another. Legal matters, more or less, come in discrete substantive packages. Moreover, lawyers in private practice generally record and bill their time to specific cases or matters.

The discrete nature of these legal packages -- cases or investigations -- or, as § 207 terms them "particular matter[s] involving a specific party or parties," means that it is relatively easy for a lawyer to comply with the bar disciplinary rules' restrictions. Similarly, it would be relatively easy for a lawyer leaving government to comply with a statutory prohibition against "aiding and advising" on particular cases or investigations on which he had worked in government. If a lawyer leaves government and joins a law firm or company, he can work on any case on which he didn't work while he was in the government. Even if his responsibilities in government were broad, a brand new case will soon come along. Compliance with prohibitions on aiding and advising such as those that have now twice passed Congress thus cause no particular disruption to a lawyer's career and do not substantially affect his ability to move in and out of government. (Although "Chinese Walls" must sometimes be built between a firm's partners.)

Scientists and Post-Employment Bans on "aiding and advising"

The situation facing scientists or technical people is very different. They are normally experts on substance, not procedure, and their knowledge pertains to broad fields of human understanding and activity -- *e.g.*, immunology, materials science, acoustic signal processing. Although they may work on specific projects in the government, their substantive knowledge is not neatly compartmented the way a lawyer's is. If they learn something from a certain project about, say, a more promising hypothesis to guide AIDS research or a new approach toward a theory explaining superconductivity, then that new notion or approach can affect their judgments on a whole range of substantive issues. When they leave government the whole nature of their professions requires them to interact with colleagues on these substantive issues. Their substantive knowledge, unlike lawyers', is essentially a seamless web.

A further problem is that, in many areas, the government's entire work in a field of knowledge may be packaged together in a single program or a very few programs. If you are a sonar expert, *e.g.*, and you become personally involved as a government employee with the new SSN-21 class submarine program, you will have become involved with, quite possibly, the only new submarine that the U.S. will design between now and well into the next millennium. Thus a very large share of the country's work on sonars could be attached in some fashion to this one program -- through prime contractors or subcontractors -- for many years. A sonar specialist who became involved while in the government with the SSN-21 program might well not be able to work outside government at all in his field of expertise for the duration of a post-government employment statutory restriction if he had to be sure he was not "aiding or advising" someone, somewhere, about some aspect of this program. Such a technical person could never be sure that what he said or wrote on substance, even if he avoided directly billing his time to a specific SSN-21 contract or subcontract, would not be picked up and used by someone as "aid" or "advice." In H.R. 5043, vetoed by President Reagan, this restriction, and consequently this concern of scientists and technical people, would have lasted for the life of the employee or the life of a particular matter, whichever was less. But for the above reasons even a two- or one-year ban, if couched in broad "aid and advise" language or similarly broad terms, effectively prohibits many scientists and technically-trained people from working outside government after they leave it. Thus unless they have other marketable skills (*e.g.* novelists) or are independently wealthy they will, and would be well-advised to, avoid government service like the plague -- because they will know that once in, they cannot leave and work in their profession without drawing suspicion. If they are already in the government they will, once informed of the terms of the law, begin an exodus similar to that which nearly occurred in early 1979 -- particularly in order to be out before a statute's date of effectiveness.

It must be remembered that we are generally dealing here with people who care deeply about their reputations and who are not interested in skirting the edges of the law. Before they will agree to work (or to continue working) for the government on scientific and technical matters they will need solid assurance not only that they won't be convicted as felons for trying to earn a living after they leave, but more: that they do not even run the risk that anyone could interpret a vague and confusing statute in such a way as plausibly to accuse them of a legal violation. Otherwise they will vote with their feet.

The Dilemma

The above are some of the reasons why post-government employment restrictions (other than those on representational activities) are so difficult to draft. It is not hard to find activities that it seems at first glance to be desirable to prohibit. But it is very hard to find a prohibition that will not deter, massively, government service by individuals badly needed by the government for their scientific and technical expertise -- individuals who understandably might want to have the option of working in the private sector at some later point in their careers.

By way of illustration, to imagine a restriction on lawyers and legislators that would have a comparable impact to a general "aid and advise" prohibition on scientists and technical people, one would have to invent something such as a restriction far broader than one dealing with particular contracts or investigations. For example, one might hypothesize a post-government employment restriction that prohibited one who had been say, a government civil rights attorney in the mid-1950s -- assuming he had been "personally and substantially" involved with the government's *amicus* brief in *Brown* v. *Board of Education* while working for the Justice Department -- from later trying to work as a private attorney specializing in civil rights and education cases without aiding or advising anyone regarding *Brown* or any subsequent case that cited it. For Congress, an imaginary restriction of parallel scope might be one that barred all members and senior staff of the Finance and the Ways and Means Committees, after they left public service, from aiding or advising anyone regarding any tax provision that became law during their tenure, or regarding any case or ruling citing such a law.

It might seem possible to avoid problems such as those set forth above by adopting some sort of "aid and advise" or similar prohibition and then establishing a special exception for providing scientific and technical information. Unfortunately the experience under the original Ethics in Government Act showed that course to be ineffective. The 1978 Act included (and still includes) two exceptions (in § 207(f)) for the provision of scientific and technical information and the early 1979 exodus began anyway, due to the broad impact of the 1978 aid and advise prohibition.

Finally, it might seem to be the case that one could avoid the above problems merely by rejecting any "aid and advise" restrictions in our Commission's own recommendations. Unfortunately, the problem is rather more difficult than that for two reasons.

Why New Legislation May be Needed

First, there is considerable Congressional interest -- deriving, it seems, in large measure from concern about the recent Defense Department procurement scandal investigation ("Ill Winds") -- in imposing some sort of prohibition against the improper use, after government service, of information obtained by an employee while in government service. A related concern is that government employees, by promising (perhaps implicitly) to provide access to such information, may enhance their likelihood of employment by government contractors after they leave government. Thus some Commission members understandably feel that if we can find a specific, focused method of deterring such behavior, while avoiding the problems set out above, we should do so.

Second, a post-government employment prohibition has already become law that is, in many ways, more sweeping than the "aid and advise" restrictions discussed above. I refer to the new § 27(e) of the Office of Federal Procurement Policy Act (a portion of the "Procurement Integrity" section, the new § 27, added last October to that Act by section 6 of the OFPP Amendments of 1988). The overall philosophy of § 27, in my view, has at its heart a sound concept -- protecting the integrity of the procurement process, especially source selection. There are a number of drafting problems in it, however, some of them in § 27(e). The new § 27(e) reads:

> "(e) RESTRICTIONS ON GOVERNMENT OFFICIALS AND EMPLOYEES.--No Government official or employee, civilian, or military, who has participated personally and substantially in the conduct of any Federal agency procurement or who has personally reviewed and approved the award, modification, or extension of any contract for such procurement shall--
>
> "(1) participate in any manner, as an officer, employee, agent, or representative of a competing contractor, in any negotiations leading to the award, modification, or extension of a contract for such procurement, or
>
> "(2) participate personally and substantially on behalf of the competing contractor in the performance of such contract, during the period ending 2 years after the last date such individual participated personally and substantially in the conduct of such procurement or personally reviewed and approved the award, modification or extension of any contract for such procurement."

Of particular interest is the prohibition in subsection (2) against participating in the "performance" of a contract for a two year period after one has participated in the conduct of a procurement or reviewed and approved a contractual action. Judge Nebeker's excellent and detailed letter to you of February 10 on behalf of the Office of Government Ethics terms § 27(e)(1) "largely redundant" and questions whether "a legitimate purpose" is served by § 27(e)(2), in light of the fact that what one is trying to insulate is the contractual process, not to restrict the ability to perform contracts. As

Judge Nebeker points out, "[t]he taxpayer, the agency and contractor benefit mutually when work specified in a contract is performed properly and efficiently" (p. 46).

Moreover, since the prohibition against participating, after government service, in the performance of a contract includes a ban on participating in the performance of a sub-contract (§ 27(n)(2)), a government scientist or technical person ~~is~~ now about to face a very broad set of restrictions indeed after he leaves government.[1/] His uncertainty, for up to two years, may be near-complete about whether he is participating in a contract's "performance" on behalf of a competing contractor or subcontractor. First of all, he may not know whether he is working for a "competing contractor" or not. The statute defines as such any contractor or subcontractor who, from an early and loosely defined point ("the period beginning with the development, preparation, and issuance of a procurement solicitation . . ." (§ 27(n)(1)) is "reasonably likely to become" (§ 27(n)(2)) a competing contractor or subcontractor. At an early stage of many procurements many companies are potential contractors and subcontractors. As the procurement process moves along, the list shrinks. Second, even if the former employee knows that he is working for a competing contractor, is the former employee participating in "performance" if he is part of the company's overhead -- *e.g.*, a researcher? What if he bills no time to "performing" but forgets and talks about his substantive scientific field in the cafeteria at lunchtime and neglects to ensure that colleagues who may be involved in "performance" are outside hearing range? Is he thus a felon?

At least 26,000 companies do some business directly with DoD -- including almost all of the Fortune 500 -- and many tens of thousands more are subcontractors. In the Defense Department there are approximately two contractual actions every working second. The situation for NASA, GSA, NIH, and other agencies that contract with, or approve substantial funds for, contractors is somewhat, but only somewhat, less complex. In perceiving this welter of relationships and the complexities introduced by § 27(e), a person of scientific or technical background (and perhaps many others as well) can have only one plausible attitude regarding government service if he believes that in order to earn a living he might need to work, shortly after leaving government, in the same general field as that of his government service. His judgment will almost certainly be never to enter government service at all, or, if he is in government now, to leave promptly.

A First Draft

In light of the above considerations, I have undertaken to try a first draft of a provision that could be added to the current § 207 to bar the disclosure or use of certain types of government information by former government employees, and that avoids some of the problems I have set out. I will readily confess that this effort could be improved upon, and also that including such a provision is not my preferred recommendation. In light of the very substantial difficulty of recruiting and retaining talented scientific and technical people to work for the government today -- a difficulty enhanced by the current federal compensation picture -- and the great importance of such people to a whole range of vital activities, from

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[1/] The date of effectiveness for § 27 is 180 days after the date of enactment, or mid-May. The section has no grandfather clause, however, to ensure that it does not retroactively apply, once it is in effect, to those now in government. Forthcoming regulations may clarify this issue.

AIDS research to DoD procurement reform,[2] I would prefer that the Commission clarify the representational prohibitions alone and include no other post-government employment restrictions. But if the Commission decides that some restriction in addition to the representational restrictions is necessary,[3] I would suggest something along the lines set out below.

It is of primary importance that any such restriction deal with former employees' use or disclosure of a clearly identifiable body of material, analogous to classified material. Much of the vice of the restrictions on former government employees set out in various types of "aid and advise" clauses or the "performance" restriction in the new § 27(e)(2) of the OFPP Act is in their inherent vagueness. If one wants to avoid wholesale deterrence of service in the government, one must only prohibit actions or uses of information that are clearly definable. This is especially important if one is using the sanctions of the criminal code.

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[2] In the Packard Commission Report in 1986 we stressed the importance of personnel reform for the civilians who participate in the acquisition process -- both senior level political appointees and career personnel. The Commission stressed the importance of improved quality and education and proposed several steps to enhance the Defense Department's ability to attract and retain qualified civilians to manage the acquisition process. I was a member of both the Commission and its Acquisition Task Force, and I can think of no Commission recommendation more important than this one -- indeed it is probably the recommendation on which almost all others depend.

[3] For the reasons set forth herein, I would recommend that all post-government-employment restrictions be set out in § 207 (or in § 207 plus one parallel statute outside the criminal code setting out civil remedies). This would suggest replacing any contemplated "aid and advise" language with something like the section I have drafted. It would also suggest replacing either § 27(e)(2) or all of § 27(e) as well, if a comprehensive scheme is to be adopted in one statute. See Judge Nebeker's letter at pp. 20-21 regarding § 27 generally: "quietly inserted into OFPP's reauthorization, without hearings or any opportunity to comment by agencies experienced in administering the present post-employment and negotiating for employment proscriptions . . . . not compatible with present law and prohibit conduct that offers no opportunity for abuse or competitive advantage . . . . doubt that they [the section's provisions] can be implemented in a manner that will afford employees fair notice . . . . cumbersome . . . . burdensome . . . will discourage government employment in the field of procurement." He urges that the Commission "strongly recommend" repeal of §§ 27(a)(1), (a)(2), (b)(1), (b)(2) and (e).

The restrictions in 10 U.S.C. 2397b and 2397c Judge Nebeker states "have caused much confusion" and also urges that the Commission "strongly recommend" repeal of them. My own experience is that these two sections have not caused the same degree of uncertainty in the minds of scientific and technical personnel as have "aid and advise" clauses and as § 27(e)(2) will once its provisions are widely known in the scientific and technical community. These two sections do, however, unfairly single out DoD personnel, when the problem of fair procurement is definitely a government-wide one. If their restrictions are valid they should be incorporated into § 207, in my view, for all government personnel.

The Defense Department's regulation regarding use of "inside information," it would seem, could also be covered and hence rendered redundant by a redrafted § 207 (see DoD Standards of Conduct Directive 5500-7, p. 3).

Finally, the older statutes prohibiting post-government service "selling" by the military, seem to me to be well-understood by the uniformed military. They speak to a particular problem of avoiding the exploitation of historic relationships based on rank and hierarchy that are unique to the military. I would leave them undisturbed.

The attached section borrows much of its language from portions of the new § 27 of the OFPP Act. This may seem odd since I have been highly critical in this letter of the new § 27(e)(2) of that Act. As I noted above, the new § 27, however, contains at its heart a sound concept -- that it is the integrity of the procurement process, especially source selection, that needs to be protected. That concept seems to me far more promising as a logical basis for legislation than general bans on "aiding and advising" or use of undefined "inside information."[4/] What I have essentially done in this draft is substantially to borrow two definitions from § (n) of the new § 27 -- "proprietary information" and "source selection information" -- and to prohibit a former government employee either from disclosing such precisely-defined information to a competing contractor or from using such information on such a contractor's behalf for at least a two-year period[5/] following the employee's government service. I have also somewhat re-written these and two other definitions as set out in § 27(n), particularly to clarify when a solicitation for a procurement begins. This is important because most of the time there is an extremely free flow of scientific and technical information back and forth between the government and the private sector for a multitude of purposes. This free flow is required both by multiple federal regulations and by the nature of scientific investigation. If one is to cut into this flow and prohibit some types of information transfer. It should be done with precision. Use of some of the concepts in the new § 27, slightly rewritten, seems to me to be more likely to permit such precision than any other concepts I have seen. My first draft of a proposed subsection for § 207, based on the ideas set forth above, is attached.

Sincerely,

James Woolsey

R. James Woolsey

Attachment

[4/] See the Defense Department regulation cited at note 3, supra.

[5/] A two-year period (unless the solicitation in question lasts longer) after employment is an admitted compromise. The logic of a ban on disclosing or using "source selection information" would end at contract award. Additionally, state law restrictions on the misuse of "proprietary information" in the form of trade secrets or the like may be adequate. But two years does not seem to me to be an excessive period to ban the disclosure or use of these two types of information as long as they are clearly labelled and identified and an employee has notice that their disclosure or use is prohibited.

DRAFT 02/13/89

New Draft Sub-section for 18 U.S.C. § 207 (following § 207(c))

(X) Whoever, having been so employed, within two years after his employment has ceased or before the conclusion of a Federal agency procurement of property or services, whichever is later, discloses source selection information or proprietary information from the solicitation for such a procurement to a competing contractor in such a solicitation, or uses such information on behalf of such a competing contractor, shall be fined not more than $10,000 or imprisoned for not more than two years, or both.[1]

(Y) Definitions. -- As used in section X:

(1) A 'Federal agency procurement of property or services' commences either (a) upon issuance of the solicitation for the procurement, or (b) at such earlier time, while such solicitation is being prepared, as may be set by the contracting officer in written notice made available to competing contractors and agency procurement officials involved. A Federal agency procurement concludes with award of the resulting contract or cancellation of the solicitation.

(2) The term 'competing contractor' with respect to any solicitation for a Federal agency procurement means a contractor or subcontractor who is actively competing with respect to the solicitation or who is identified as a competing contractor in the written notice (or a supplement thereto) from the contracting officer to competing contractors and agency procurement officials involved.

(3) The term 'source selection information' means information so marked under the direction of the head of the agency or the contracting officer and which is both

(a) information the disclosure of which to a competing contractor would jeopardize the integrity or successful completion of the solicitation concerned; and

(b) information that is required by statute, regulation, or order to be secured in a source selection file or other restricted facility to prevent such disclosure, unless a specific exception is granted by the head of the agency.

(4) The term 'proprietary information' means information that has been submitted to the Government in response to a particular solicitation, marked by the contractor, the head of the agency, or the contracting officer as "proprietary," and that is proprietary under law and regulation. Such information may include, but is not limited to:

(a) information contained in a bid or proposal in response to the solicitation for the Federal agency procurement; and

(b) cost or pricing data of a competing contractor submitted in response to such solicitation.

1/ Underlined portion in current § 207. Commission is elsewhere reviewing penalties, civil remedies, etc.

[From the Washington Post, Feb. 5, 1979]

THOU SHALT NOT—WHAT?

The good news is that people in Congress and the executive branch have, over the past several years, got rid of the defective notion that conflict-of-interest is something a person might be afflicted with on the way into government, but not on the way out. For it used to be that almost no mind was paid to what a person did by way of exploiting his government connection once he had gone on to the private afterlife, just as long as he had been more or less stripped of relevant assets—and dignity and privacy—before taking federal employment that is different. A great deal of attention is paid to the manner in which people depart government service and how they behave once gone. And that brings us to the bad news: As seems to be the American way in these matters, the nation has evidently once again overdone it, crafting a statute governing the post-governmental life of federal officials that is punitive and misguided to a degree almost bound to cause an exodus of decent and valuable people from office.

We are not using the word "punitive" metaphorically here. Three punishable crimes are established in the statute (the Ethics in Government Act of 1978) whose labyrinthine terms are only now beginning to become clear to the wide variety of individuals who will come under its jurisdiction. Roughly, these involve: 1) a strengthening of the terms of a lifetime ban (already in effect) against almost any federal employee's representing outside interests in cases before government concerning matters with which he had had a substantial personal connection while in office; 2) a sort of year-long limbo for top-level executive-branch officials and military officers who will be barred from having any professional dealings with their former agencies or place of work for the first 12 months after they have left office; and, 3) a provision that these same top officials may not, for two years after leaving office, "aid, assist, counsel, advise or assist in representing" anyone before the government on a matter for which he had responsibility, even indirectly.

This last one is the big potential troublemaker. It does not just require that a person avoid fishy or even remotely questionable contact with government himself after leaving office. Practically speaking, for many people this could also cut off for two years the opportunity for work for almost anyone who had almost anything to do with their former employer. Hale Champion, the undersecretary of HEW, observed the other day that this would pretty much cut him off from any reasonable employment opportunities when he leaves office, and the same is probably true for countless others—especially scientists, educators and technicians.

The big furor in government about this now concerns the fact that unless individuals have left office by July 1 of this year, they will come under the new act's terms. So there is considerable heaving and hoing about what to do to tame the trouble. Naturally, by way of making the thing "reasonable"—this is always what happens—the legislators put in certain explanations and refinements and exceptions which, as always, only have made matters more complicated. What is it exactly that thou shalt not do, if thou happens to be an affected GS-17? No one can be entirely sure. An Office of Government Ethics (Orwell would surely have called it the Ministry of Virtue) has been established to sort matters out. Presumably in the regulations it is scheduled to issue, the ethics office can in some measure modify the harshness of the law. But felonies—two years and $10,000—are felonies. And bad law is bad law. We think the administration and Congress should start urging a rational and generous interpretation of the "regs" on this law as an immediate step—and that Congress, with administration support, should start cranking out some amendments to undo the over-reactive and under-intelligent aspects of the law itself—and fast.

REGULATING LEGISLATION

Senator **BINGAMAN**. Thank you. I guess part of the problem here, at least as it is explained to me, is that many who participated in the passage of the legislation in the last Congress did so with the idea that most of these problems would be fixed by regulation and that the statute was general enough in its language to permit regulations that would essentially put at ease those folks who were not intended to be kept out of the system. You refer to the false targets that this legislation now hits, and point out that the problem is that by its language and as interpreted, it hits too many false targets, too many people that were not supposed to be affected.

What is your view? Is this something that the Congress needs to wade in on again and try to legislate on again, or is this something that—the Congress reasonably anticipated—could be done by regulation?

Mr. WOOLSEY. I have tried to look at the portions of the statute—subsection E and related provisions in the definition section and in subsections A, B and D—that relate to this problem of attracting and retaining able scientific and technical people. I think there are probably a number of improvements that could be made by a rather bolder approach toward drafting regulatory language than we have seen so far.

The Office of Federal Procurement Policy itself a short time ago made a noble effort to clarify further some aspects of the law, but let me give you an illustration of something I think badly needs to be fixed by statutory language because so far the regulators have been unwilling and unable to fix it.

There is now language from the Office of Federal Procurement Policy that suggests that if, after a person leaves the Government, he is involved in scientific and technical work and not in advising on negotiation strategy, then he is not deemed to be participating in negotiations. That's a plus from the point of view of the values I have been suggesting need to be advanced here.

But there is nothing comparable to clarify whether or not a person is, after he leaves the Government, involved in the performance of a contract if he is just generally working on research and development or general overhead in a company or in a company's laboratory and is not directly billing his time by direct labor charges to performance on the contract that he was involved with on the inside.

Most people in the defense acquisition world know the difference between IR&D or general administrative overhead support, on the one hand, and on the other, direct labor billing. They can understand that. They can't understand what they have seen so far, and consequently I think that many of them would probably hope very much that the definition of performance of a contract would be clarified by a statutory language. There are several others on pages 6 and 7, but that's one that pertains directly to what we have been talking about, Senator Bingaman.

CLARIFICATION

Senator BINGAMAN. So, the bottom line is that you think that some clarification of some of these terms is required in order that whatever regulations that are issued and ultimately become effective in this area will properly interpret the intent of Congress.

Mr. WOOLSEY. I believe so. They may well be changes that do not look to be extraordinarily major to the outside world, but to people who are involved in trying to enforce the statute and make it work, they could make a great deal of difference.

For example, in subsection D of the statute, there is a two-tiered certification process. An overall contracting officer for a contract certifies to the Government that certain information has not been improperly transmitted and so forth. But he is supposed to have in hand a second tier of certifications from employees, agents, officers, representatives and consultants of the company. One large defense company has publicly estimated—it has about 100,000 in its work force—that it would probably annually have to have about 40,000 certifications from people to various contracting officers.

Now, these certifications are serious business. There is a constitutional question, I think, on whether or not those certifications constitute State action because they have been required by a statute. If they do, then some interesting questions present themselves. Do contractors need to issue warnings to their employees before they file these certifications, 40,000 warnings? And if an employee fails to file one and he files a statement of his Fifth Amendment rights instead, can he be discharged for doing that? And if his certification contains a disclosure about some former government employees and it has been filed without due notice to that former employee, is the Government's investigation of any wrongdoing tainted?

This is in many ways, because of words such as "possible violation," almost a lawyers' employment act of 1988, Mr. Chairman. I don't mind having legal business, but I would just as soon in the public interest that it not be acquired by seeing statutes with vague language like this passed.

There are perfectly reasonable phrases that one could have used instead of "possible violation." One could use a standard such as the one that Congress used in the Anti-kickback Act: a reasonable basis to believe that there is a violation. It makes a great deal of difference whether or not you are certifying that Woolsey may have possibly done something wrong or that you are certifying that you have a reasonable basis to believe that Woolsey has or has not done something wrong.

There are things like that that I think badly need to be fixed in statutory language, but they are changes that many people outside the world of specialists that deal with these matters might regard as relatively minor clarifying changes.

Senator BINGAMAN. Thank you. My time is up.

Senator Wallop.

Senator WALLOP. Thank you for your testimony here this morning.

I sense that from a lawyer we are beginning to hear something that is unusual coming from lawyers and that is that ethics and law differ, that what we are in danger of doing through fear of another scandal is establishing a standard of mediocrity by playing, as you say, to the outside world rather than designing for the real needs of the Nation. I think you can get so frightened of wrongdoing, that rightdoing becomes impossible, and we are right on the threshold of that, if not already wallowing in it.

I am interested that the only thing that requires experience now perhaps is the Justice Department. Nobody would design the attorney general as somebody not coming from the law or returning to the law. It is a standard that we ought not to lose sight of in the process of trying to govern our Nation.

You, I think, correctly point out that what we are trying to do in defense procurement is not outwit the Government, but outwit the enemy. I don't know quite how you get there except by establishing an understanding, an era of competence. I am frightened that too many laws and too many rules will simply not prohibit immoral behavior, but so constrain competent behavior as to make it beyond our reach.

Your recommendations are good, but let me just begin by saying in such a politically charged atmosphere, as it now seems, how could we expect Federal regulators to interpret in a less onerous fashion than they have the laws passed by the Congress in the wake of the acquisition scandals?

Mr. **Woolsey**. I think that it is going to be difficult to push those who draft the FARs and the DARs a great deal further. They have used some latitude already in interpreting these statutes. There are probably two or three places where they could do something more than they have done.

I will give you one example that permeates the statute which is the definition of when a solicitation begins for a procurement. That is so vaguely drafted—and the time that a procurement ends also has some problems of clarity—that it may be that a procurement just sort of runs on and on and on and on. And so, any information that is solicited in the course of it may be source selection sensitive information. That information may be transmitted orally and under the regulations it need not be marked. There is an encouragement to mark, but not a requirement. So, if you and I are talking about a defense problem, we may not know whether or not the solicitation has begun, whether or not it has ended, or whether or not what we are talking about is source selection sensitive.

It would not be that difficult to redraft those two portions of the statute to make it quite clear—and I have tried my hand at it in this attachment to my letter to Judge Wilkey—when a solicitation begins and when it ends. It is not that difficult a concept in acquisition law.

But in order to sweep in anything that might imaginably be a problem, the way those definitions sections of the statute are drafted, you have ended up with something, as I said, that I think shoots down an awful lot of false targets. And I don't think the regulation writers can fix that for the Congress.

Senator **Wallop**. Well, I worry that we are on the threshold of dividing the Nation between those who work for the Government and those who do not. And you never have any cross-fertilization between these. And I don't think that that would resolve all the problems of immoral behavior either inside the Government or outside the Government.

I would prefer us to go after and punish things that are knowingly and credibly acts of malfeasance or illegal acts, and punish those. Let us have the advantage of retiring military officers who can, because of their experience and understanding of the needs of certain military capabilities, be of genuine help to the country when they get into the employment of contractors.

Mr. **Woolsey**. Senator Wallop, I completely agree. By the double-dipping legislation, which is I think an artifact of the Vietnam era in a way, we have made it very difficult and we have certainly discouraged well-trained, talented, scientifically and technically trained military people from staying on in a civilian capacity in a job that they are well prepared for.

By the whole pay raise imbroglio, we have made it virtually impossible for scientific and technical people who work for the Government to earn anything close to what they could make on the outside.

By these ethics provisions in section 6 and some that are threatened in various pieces of legislation amending section 207 of the Criminal Code, we are discouraging scientific and technical people from working for the Government by essentially telling them that they can't work in their chosen field for 2 years after they leave.

And just to put a capstone on it, in section C of section 6, a sort of catchall prohibition of disclosure to unauthorized persons—that section of the statute is drafted so broadly that I believe along about July 16 you will see most of the members of the various scientific advisory boards to different parts of the Government resign. Because this statute does not just reach full-time Government employees, it reaches so-called special Government employees even if uncompensated. So, whether they are the peer review people at the National Institutes of Health, the doctors who are looking at AIDS research, or whether they are the Defense Science Board members or whoever, they may not want to take a chance that someone is going to say that they have been given access to proprietary or source selection information and then that they have disclosed it to someone not authorized to receive it. This may be partially because they may not know what source selection information is, since it can be oral and it can be unmarked and so on. The safest thing to do under those circumstances is simply not to help the Government at all. You don't come to work for the Government full-time because of these other discouragements, and now you don't even offer the Government your scientific and technical advice because you are afraid of running afoul of some provision of the law.

The Government is trembling on the verge of putting itself in the position of being able to make absolutely perfect scientific and technical decisions on major matters: perfectly uninformed.

Senator WALLOP. Mr. Chairman, my time is up, but I think that this has been important testimony. And going back to your earlier metaphor of selecting targets, it seems to me you may find a way of preventing a procurement scandal, but you will have procured things that you absolutely don't need. Who better able, for example, to help you design the interior of a fighter cockpit than a fighter pilot, or the needs of a submarine at sea than a former submarine engineer or commander? And yet, to say to those people that they are out for 2 years, and things will have changed by the time they come back, is to lose a level of expertise that we need.

And I earnestly hope that we set aside some of our fear of scandal and begin to focus on the genuine needs of the country.

OFFICE OF FEDERAL PROCUREMENT POLICY ACT

Senator BINGAMAN. Jim, let me ask you about how we got where we are. The problem areas that you have identified here were all part of the reauthorization of the OFPP Act, the Office of Federal Procurement Policy Act, as I understand it, which went through the Governmental Affairs Committee last year and not through the Armed Services Committee.

Mr. WOOLSEY. I think so, Senator Bingaman, but I believe this section 6—staff can correct me if I am wrong—had no hearings and no consideration in the Senate. It was entirely a product of the House and was agreed to in conference.

Senator BINGAMAN. I think that is right. But I guess my concern here is—it is obvious that a lot of us probably share responsibility for not having caught some of this as it was being considered.

My information is that the OMB director at that time, the acting director, was requested by the Governmental Affairs Committee chairman on the Senate side to review this proposal and see whether or not it was something that was satisfactory. And he wrote back and said that, "This amendment satisfies the concerns raised by the administration on previous versions of the legislation. The administration supports its passage."

We put a provision in last year's defense bill which directed the Under Secretary of Defense to advise us as to any areas that required attention affecting procurement, and we got this report in December which made no real reference to this as a problem area. What is our difficulty? Obviously, we have a lot of difficulties here in Congress, but why is that no one in the administration would identify any problem in these areas until after the law becomes effective?

Mr. WOOLSEY. Senator Bingaman, I do not know this for a fact, but I have heard that the Defense Department and other agencies of the Government that deal with scientific and technical people had serious problems with section 6, but that they were not successful in persuading OMB to object to the provisions of the bill.

Senator BINGAMAN. I see. But there was serious concern in the administration as far as you understand. It just wasn't brought to the attention of Congress.

Mr. WOOLSEY. I believe there was some, yes, in lawyers' circles, general counsel circles, within several parts of the executive branch.

CIVIL SERVICE PAY CAP

Senator BINGAMAN. One other related problem, not the same as what you have come here to testify on, but it relates to the civil service pay cap that exists. We had Secretary of Energy Watkins before the committee a few weeks ago, I guess 2 weeks ago. And he asked that at least a handful of people be exempted from that pay cap in his Department so that he could get the people he needs to properly do the cleanup of the DOE weapons complex that he needs to pursue. And, of course, we have the NASA Administrator indicating he wants some people exempted, and NIH wants some people exempted. And I assume as soon as they hear about it, every other executive agency will.

What are your thoughts on this pay-cap issue and what should Congress do and what should this committee, the Armed Services Committee, do on that issue in this defense bill?

Mr. WOOLSEY. Well, Senator Bingaman, we considered this on the President's Ethics Commission and although we were not really charged with the overall question of executive and legislative branch pay, we had, as one member of the Commission, Mr. Cutler, who had recently come from his experience on this particular issue, and so we did discuss it at some length. And I think it is fair to say that the opinion in the Commission—and it manifests itself in the Commission's report—was very strongly in favor of a pay increase both for Congress and the executive and judiciary.

And further, although that Commission didn't discuss it, the Packard Commission at some length talked about the excellent results the Navy achieved in its China Lake project, which you have taken the lead in putting forward as a model for legislative change. This would permit particularly the Department of Defense to manage its senior scientific and technical people without the constraints of many of the historic civil service restrictions, essentially within broad bands to pay on merit and promote on merit.

I think those two changes, a reasonable pay increase across the board and the flexibility for particularly scientific and technical managers and acquisition personnel at a senior level to be dealt with along the lines of the China Lake model, would do a great deal to remedy some of these problems. I do think the revolving-door problems are a piece of the puzzle, and the advisory board restrictions are a piece of the puzzle, and the double-dipping is a piece of the puzzle. If all of those were changed, I think we would be in fine shape.

But of the things that I hear from friends who are leaving the Government and refusing to come into the Government with scientific and technical backgrounds these days, I think it is the revolving-door legislation and the pay cap that are mentioned really more than anything else. And you tend to get them both together. People tend to mention them almost in the same breath.

Senator BINGAMAN. Thank you. My time is up.

Senator Wallop.

REVOLVING-DOOR LEGISLATION

Senator WALLOP. I would just conclude by saying the revolving door legislation is a double pay cap.

Mr. WOOLSEY. Yes.

Senator WALLOP. And a false one. In fact, there are probably a lot of people in this country willing to give service to the Government so long as they are not restricted in their ability to perform service either to the Government or in their chosen profession when they leave it. But to give up a lifetime of expertise in aeronautical engineering, for example, for the privilege of serving your Government underpaid for 2 or 4 years is shortsighted on the part of America. I am almost certain that the double pay cap inherent in the revolving door legislation is more serious to us than the pay cap of service at a given moment.

Mr. WOOLSEY. That may be true, Senator.

ACROSS-THE-BOARD PAY INCREASE

Senator BINGAMAN. Let me ask just one follow-up. If it were determined that an across-the-board pay increase and implementation of the China Lake model were not politically accomplishable in this Congress, do you think we should go forward with the kind of suggestion that Secretary Watkins and others have made, and that is just try to exempt a small number of their key positions from the existing pay cap?

Mr. WOOLSEY. I would say that it may be a reasonable thing to do. I believe making the changes in the revolving-door legislation are probably more important because a lot of people are probably, as Senator Wallop has suggested, willing to take fairly substantial pay cuts to work for the Government for a few years. They just don't want to have to give up their profession.

But a package that made some changes in section 6 and implemented Secretary Watkins' and the other cabinet members' suggestions with respect to scientific and technical people and senior managers of certain kinds might be something that would get the Government through a year or two until perhaps the pay issues could be considered more fairly.

Frankly, I would try to tie an amendment to the double-dipping legislation in there because a number of these jobs can be very effectively filled by retired military people as long as you are not taking away the lion's share of their retirement pay when you try to get them to stay on as civilians.

ACQUISITION CORPS

Senator BINGAMAN. Let me ask about one other area that, again, you didn't address and you weren't asked to address in your testimony. I think it is one that we heard other testimony about in this subcommittee, and that is the whole issue in the area of personnel, the whole issue of whether we need to look at some fairly radical departure, such as establishment of an acquisition corps. I guess there are proposals on the House side to create an acquisition agency outside DOD.

Professor Fox in particular has been advocating the establishment of an acquisition corps which is within DOD, but which would in his view provide greater career opportunity and stability and expertise in the key acquisition personnel. He would favor it, as I understand it, both on the civilian side and the military side.

But are there any general thoughts you have on that? That is a whole other subject and we didn't really advise you we were going to get into it. I would be interested in your thoughts.

Mr. WOOLSEY. It is an important one, Mr. Chairman. It is one that we got into in some detail on the Packard Commission.

First of all, I think that we agreed on the Packard Commission that the uniformed military really has shown decided improvement in the way they have committed people to acquisition careers and managed acquisition over the course of the last 10 or 15 years. It is not perfect. You could have and would want program managers to have longer tenures, but the defense management school down at Fort Belvoir, does a good job. There have been—we thought and I think—some decided improvements in the utilization and managerial skills in technical areas of the career military.

Several of the services in different ways allow people and encourage people to channel their careers toward acquisition. John Lehman, when he was Secretary of the Navy, set aside a certain number of flag billets for people with an acquisition background. The Air Force has pushed this idea for some time. You have distinguished acquisition managers, such as Larry Skantze who just retired a year or so ago from the Air Force Systems Command, who have been program managers three or four times and have held senior acquisition jobs. The Army has perhaps done it somewhat less than the Air Force and the Navy, but they also have taken some important steps recently.

Whether or not that constitutes having an acquisition corps in each service or not is partially a matter of semantics. Acquisition managers don't wear a separate insignia. But, for example, in the Navy Department, there are Engineering Duty Only [EDO] and Aviation Engineering Duty Only [AEDO] officers, and have been for many years. They have a separate specialty and serve in acquisition areas almost exclusively. So, each service has done a great deal to move in that direction.

I think that it is important to realize that there are 15 million contracting actions annually in the Department of Defense. That is essentially two every working second. Steps to centralize the management of acquisition, either in an acquisition corps or in the sense of having the Office of the Secretary of Defense and its staff actually make the lion's share of acquisition decisions, seem to me to be running against the really vital need to have centralized policy but decentralized implementation in defense acquisition.

Now, we have had these "Ill Wind" investigations and none of us who is outside the system really knows what they are all going to bring forward. But so far we have not seen large numbers of uniformed military people who are well trained in acquisition, active duty people, implicated in these scandals. If people are worried about acquisition scandals and some of the problems that have developed either at the military department level or at the Office of the Secretary of Defense level through civilians, it does not strike me that the immediate answer to these types of difficulties is to further centralize and civilianize acquisition management.

I come from a perspective of 3 years as a service Under Secretary, and I think that although the services sometimes are recalcitrant and sometimes don't want to make the policy changes that their superiors in the Office of the Secretary of Defense or staff people there often think are important, it is also important to realize that in many cases they been right to resist those reforms.

It was not the admirals who folsted total package procurement on the Navy as a way of designing and buying whole new classes of ships at a brand new yard with labor problems in the 1960s. It was the civilian acquisition reformers from the Office of the Secretary of Defense. The grumpy old admirals who wanted to keep doing things their own way were right, and the bold, new innovators from the Office of the Secretary of Defense were dead wrong.

So, I think there needs to be a little seasoning of this enthusiasm that sweeps around from time to time about establishing a centralized corps, particularly of civilian acquisition managers, that will make sure the services do it all their way and get it all straight.

I think we would be very well advised to centralize and improve some of the policy direction of the services in the ways that we recommended on the Packard Commission. I still very much stand behind those.

I don't think the uniformed services are doing a bad job at all in terms of improving the career opportunities of uniformed program managers and other uniformed acquisition managers. And given the lack of success we are having in attracting and retaining civilians in acquisition arenas, I think that a reform to further centralize and civilianize acquisition now, when in many cases the only people who really know what they are doing are the uniformed military acquisition managers, would really be a very, very poor reform indeed.

Senator **BINGAMAN**. Well, thank you.

Senator Wallop, do you have any other questions?

Senator **WALLOP**. No, thank you.

Senator **BINGAMAN**. You have been very generous with your time. We appreciate this excellent testimony. We undoubtedly will be back in touch as we work on these matters with some other better conceived questions. Thank you very much.

Mr. **WOOLSEY**. Thank you for having me, Mr. Chairman.

Senator **BINGAMAN**. The other two witnesses, if they could come forward, are Dr. Brandt and Dr. Graham. I have very impressive resumes of each of you here, but I will not go through that. We will just indicate that Dr. Brandt again is with the Center for Naval Analyses, and Dr. Graham is the Assistant Director for the Strategy, Forces and Resources Division of the Institute for Defense Analysis. Why don't we start with Dr. Brandt please?

STATEMENT OF DR. LINDA S. BRANDT, PROJECT DIRECTOR, CENTER FOR NAVAL ANALYSES

Dr. **BRANDT**. Thank you.

Mr. Chairman and members of the subcommittee, I appreciate the opportunity to appear before you today. As you stated, I'm the Project Director at the Center for Naval Analyses for the study on acquisition documentation and reporting requirements.

Our study began in 1987 at the request of the Acting Assistant Secretary of the Navy for Research, Engineering and Systems. He expressed concern that the proliferation of requirements for documentation and reporting interferes with program managers' ability to do their primary jobs.

I have submitted testimony for the record. My statement today will summarize the methodology, findings and recommendations of that study.

The study led to a series of recommendations for improvement which were presented to the Under Secretary of the Navy. He endorsed these options and Navy staff has been working with other services and with the Office of the Secretary of Defense to carry out a phased implementation effort. CNA has continued to provide analytic support.

The study team used four research techniques: interviews with acquisition experts from the Defense Department and each of the services; a detailed review of format, content and sources of authority for 22 DOD-wide acquisition-related status reports and decision documents; a questionnaire administered to producers of reports and documents in 45 Navy, 25 Air Force and 15 Army program management offices; and interviews with 26 users of reports and documents in the services, OSD, congressional staffs, the Congressional Budget Office and the Office of Management and Budget.

Our findings and recommendations are based on a synthesis of the results from these methods. In considering our findings, it is important to distinguish between status reports, used primarily as reporting vehicles, and decision documents, which require approvals and upon which future actions are frequently contingent.

FINDINGS

What did we find? First we found, perhaps not surprisingly, that the burden is real. Documentation and reporting requirements impose a significant workload burden, and there is duplication and overlap among the reports. Project management officials spend significant fractions of their time on preparation and approval of documents.

We found duplication and overlap in the content of documents, especially status reports, and a lack of consistency in definitions, formats and procedures. These problems are important because they cause additional work in the program offices and because they produce seemingly similar reports with potentially different numbers in them.

Second, we looked at Defense Enterprise Programs [DEPS] and found that the Defense Enterprise Program status provided little relief. The Defense Enterprise Program was designed to streamline certain programs and provide relief from regulations not required by law or Federal acquisition regulations.

Looking at only a small portion of acquisition documentation, we found that 16 of the 22 most important DOD-wide acquisition documents and reports are required by law, Federal acquisition regulations or Office of Management and Budget circular. Of the six remaining DOD-imposed requirements, four are decision documents of value to the program managers. Consequently, for these documents only, the benefits of DEP status are largely illusory.

DEP program managers face other problems as well. They have heavy briefing workloads, keeping buying command, sponsor, secretariat, and OSD offices informed. Program managers consider these briefings to be essential to protecting their programs and budgets. Even with approved baselines, Defense Enterprise Program managers are unable to enforce a real contract for program stability.

All program managers face these problems, but DEP program manager have not been freed from them.

Third, there are significant inconsistencies in the requirements for baseline and deviation reporting. The concept of baselining involves a formal specification of and agreement to key program parameters and baseline values. The Packard Commission recommended that programs be stabilized and that DOD fully institutionalize baselining.

Currently, there are a variety of statutes, directives, instructions and policies that relate to baselines and deviations from those baselines. Baselines of some type, as well as criteria and mechanisms for reporting deviations from those baselines, are specified in 10

U.S. Code, section 2432, Selected Acquisition Reports; section 2433, Unit Cost Reports and Unit Cost Exception Reports; section 2435, Enhanced Program Stability; and section 2437, Milestone Authorization for Defense Enterprise Programs.

In addition to the four congressionally mandated baselines, many of which have different data elements, deviation thresholds and reporting mechanisms, OSD has implemented the concept of baselining through a variety of directives, instructions and policy letters. At the time of the study there were seven directives, two guidance letters and their attached instructions—a total of 11 pieces of guidance.

The Packard Commission believed that baselines would promote program stability by allowing program managers to manage within the confines of agreed-upon baseline contracts. Because budgetary changes are automatic for rebaselining, the program manager cannot count on a contracted level of resources and thus a stable program.

The CNA study provides options for resolving or easing most of the technical baselining problem I mentioned earlier. The study does not, however, address the basic policy question of whether the baseline should or can be a method to ensure program stability or whether it should be viewed simply as a device to certified program executability at current funding levels.

Four, users had mixed views regarding the usefulness, quality and timeliness of reports and documents. Heavy workload, duplicative and overlapping requirements and inconsistent guidance can increase the vulnerability to error, misinterpretation and delay. We did find, however, that users we interviewed felt that decision documents are useful, influential and not redundant. Examples of useful decision documents are the System Concept Paper and Decision Coordinating Paper. The acquisition plan and the test and evaluation master plan were regarded as particularly useful. These are all OSD documents. They are not sent to Congress.

Status reports were found to be less useful and much more duplicative. The Selected Acquisition Report in its current form presents special problems to almost everyone, but the comments by users indicated it had the potential of becoming a powerful, useful, workload-reducing report. The exploitation of that potential became the basis for several of the recommendations for improvement that grew out of CNA's study.

Five, not all reporting burdens are unwelcome. We found widespread recognition among program managers that documentation and reporting serve useful purposes. In particular, program managers recognized that effective documentation is essential to building support for their programs. They also recognize that four of the program decision documents were important, though they might not agree with the format, content and approval requirements.

The challenge then is to develop agreements on what the documentation and reporting requirements should be.

Six, no single actor controls the solution. If there is to be reform of program documentation and reporting requirements, then a central question is the responsibility and authority for that reform. We found that no single actor controls all elements of the solution.

Only 6 of the 22 DOD-wide reports and documents we examined are purely a result of DOD requirements. The other 16 stem from statutes, OMB circulars or the FAR. Any attempt to streamline or eliminate most reports or documents would involve changes beyond the purview of DOD alone.

We did find that modest changes are within the authority of the services.

Some potential changes are within the authority of the Department of Defense, but even there authorities are divided between the Under Secretary of Defense for Acquisition and the Comptroller. And, of course, all of the services must work together.

Some potential changes, notably revising baseline definitions and consolidating status reports, require legislation.

Seven, we did find that there is a basis for improvement and for consensus. We do believe that there is a basis for reduction in the program documentation and reporting burden and that there is a basis for consensus, at least on limited reforms. For example, many users felt that a reformatted Selected Acquisition Report, if complete and credible, could replace several current status reports.

RECOMMENDATIONS

Based on the findings of our study, we offered five recommendations. Two of these could be undertaken quickly.

The first is resolve inconsistencies in policies and procedures for documenting and reporting baselines, deviations and penalties. Program managers should not have to cope with the welter of conflicting statutes and directives governing baselines and deviation reporting. We recommended that changes be made in the relevant DOD directives and in sections 2432, 2433, 2435 and 2437 of 10 U.S. Code.

Second, replace several status reports with one report. The basis for a consolidation could be a reformatted Selected Acquisition Report. A reformatted SAR would ease the problem of report overlap, standardize data elements and simplify report writing, scheduling and deviation reporting. In addition it would help eliminate the apparent inconsistencies found in similar but separate reports.

We made specific suggestions to the Navy for these two recommendations. Those suggestions are currently under review in the Department of Defense.

For the other three recommendations, we did not provide detailed suggestions for implementation. They are very briefly: one, examine potential improvements in decision documents; two, simplify and speed up the document review and approval process; and three, provide aid to Navy program management staff offices for document and report preparation.

In conclusion, we believe there are significant possibilities for improvement, some achievable in the short term.

Mr. Chairman, that concludes my statement. I would be happy to answer any questions.

[The prepared statement of Dr. Brandt follows:]

STATEMENT BY DR. LINDA S. BRANDT
CENTER FOR NAVAL ANALYSES

INTRODUCTION

Mr. Chairman and members of the Subcommittee, I appreciate the opportunity to appear before you today. I am Dr. Linda Brandt, Project Director for the study of acquisition documentation and reporting requirements at the Center for Naval Analyses. The study analyzed the burden that certain DOD-wide documents and reports place on program managers, explored the perceptions of users of such documents, and suggested options for improvement based on those analyses and user inputs.

My testimony is organized as follows:

- This introduction
- Some background describing CNA and the origins of the study
- A brief description of the various methodologies employed in the study
- Findings of the study
- Recommendations for reducing the documentation and reporting burden
- Summary

BACKGROUND

Before dealing with the specifics of the study, I would like to give you a brief description of the Center for Naval Analyses (CNA). CNA is the oldest organization that conducts operations research and systems analysis for the military services. It is a nonprofit Federally Funded Research and Development Center that traces its origins to 1942, when the Antisubmarine Warfare Operations Research Group was created to help defeat the German U-boats. CNA's current efforts for the Navy and the Marine Corps range widely, from support of training and testing activities in the fleet to evaluations of future technologies, forces and strategies, and resource management systems designed to aid top-level decision makers in Washington.

Our study--titled "Program Documentation and Reporting Requirements: Reducing the Burden on Program Managers"--began in 1987 at the request of the acting Assistant Secretary of the Navy for Research, Engineering and Systems (ASN-RE&S). He expressed concern that the proliferation of requirements for documentation and reporting interferes with program managers' ability to do their primary job, the efficient acquisition of quality weapon systems. During the early part of the study, two separate but related issues also became matters of concern: Defense Enterprise Programs (DEPs) and baselining. Those two topics are also addressed in this statement.

The study led to a series of recommendations for improvement which were presented to the Under Secretary of the Navy, Mr. Garrett, who was also the Navy's Service Acquisition Executive (SAE). Mr. Garrett endorsed these recommendations, and the Navy staff, with continuing analytical support provided by CNA, has been working with the other Services and with OSD to carry out a phased implementation effort.

METHODOLOGY

The study team used four research techniques:

- Extensive interviews with acquisition experts from OSD and each of the Services
- A review of format, content, and source authorities for 22 DOD-wide acquisition-related reports and documents
- A questionnaire administered to producers of reports and documents in 45 Navy, 25 Air Force, and 15 Army Program Management Offices (PMOs)
- Interviews with 26 users of reports and documents in the Services, OSD, Congressional staffs, the Congressional Budget Office (CBO), and the Office of Management and Budget (OMB)

Our findings and recommendations are based on a synthesis of the results from these various research activities. For example, findings related to Defense Enterprise Programs (DEPs) draw heavily from the expert interviews, from report producers' estimates and insights, from interviews with DEP personnel, and from our research into the source authorities for DEPs during our document analysis.

Interviews With Acquisition Experts

We began by interviewing acquisition personnel in the Navy, Army, Air Force, and Office of the Secretary of Defense (OSD). Those interviewed included program managers and staff members, contracting officials, and oversight and policy personnel. We made sure that managers of Enterprise programs and their staffs were included. These "reconnaissance" interviews provided experts' insights into acquisition-related reporting and documentation and helped provide focus for the study.

Review of Acquisition Documents

The study team characterized the documents analyzed as either status reports or decision documents. Status reports were defined as primarily reporting vehicles. Their issuance and acceptance are driven more by the calendar than by decision points for programs; nor are future actions necessarily contingent on their approval. The Selected Acquisition Report (SAR) and the Unit Cost Report (UCR) are examples of status reports. Decision documents are those documents that require approvals, and future actions are almost always contingent upon those approvals. The Test and Evaluation Master Plan (TEMP) is an example of a decision document. It must be approved by a variety of authorities within a Service and in OSD before a program can proceed with a planned test.

The study team examined 22 DOD-wide acquisition reports and documents, listed in table 1, but placed special emphasis on four major status reports and six primary decision documents. The status reports were the Selected Acquisition Report (SAR), Congressional Data Sheet (CDS), the Unit Cost Report (UCR), and the Defense Acquisition Executive Summary (DAES). The decision documents were the Test and Evaluation Master Plan (TEMP), the System Concept Paper (SCP), the Decision Coordinating Paper (DCP), the Acquisition Plan (AP), the Cost and Operational Effectiveness Analysis (COEA) report, and the Program Baseline document.

Our in-depth analysis involved reviewing these ten special-interest reports and documents for content, format, internal and external consistency, overlap, and duplication, and for their sources of authority (i.e., Navy/DOD directives, the Federal Acquisition Regulation (FAR), the Defense Supplement to the FAR (DFAR), OMB Circulars, and statutes).

Questionnaire

CNA also prepared a detailed questionnaire, covering about 400 items, to be administered to program office personnel. It elicited information on program office size, percent of senior management time involved in document preparation and review, and estimates of the time and effort involved in preparing and obtaining approval for the ten key DOD-wide reports and documents mentioned earlier. It also provided the opportunity for program office personnel to rate their perceptions of the internal and external usefulness of the documents, to identify document overlap, and to offer their thoughts on improving the system. The results of these questionnaires were subjected to various validity checks and were found, with few exceptions, to contain useful data.

Table 1. Reports and documents examined in the study

	Abbreviation
Selected Acquisition Report	SAR
Defense Acquisition Executive Summary	DAES
Unit Cost Report	UCR
Unit Cost Exception Report	UCER
System Concept Paper	SCP
Cooperative Opportunities Document	-
Acquisition Strategy Report	-
Common-Use Alternatives Statement	-
Cost and Operational Effectiveness Analysis	COEA
Competitive Prototyping Strategy Report	-
Test and Evaluation Master Plan	TEMP
Mission Need Statement	-
Independent Cost Estimate	ICE
Decision Coordinating Paper	DCP
Program Baseline Document	-
Baseline Deviation Report	-
Manpower Estimate Report	-
Congressional Data Sheet	CDS
Program Element Descriptive Summary	-
Acquisition Plan	AP
Business Clearance	-
Contract Award Report	-

While our initial focus was on 45 Navy program offices spread among the three major hardware Systems Commands of the Navy (NAVAIR, NAVSEA, and SPAWAR), we later expanded our efforts to include 15 Army and 25 Air Force program offices. Their cooperation and support were excellent, and we have shared our findings with them.

Interviews With Users

Finally, we conducted in-person interviews with 26 users of the reports and documents in the Navy, OSD, Office of Management and Budget (OMB), Congressional Budget Office (CBO), and Congressional staffs. The interviewees were questioned about their views concerning document utility, format, content, and possibilities for improvement.

FINDINGS

I. The Problem Is Real

Our first finding is that the problem is real. Documentation and reporting requirements impose a significant workload burden, and there is duplication and overlap.

A. Overall Burden and Program Office Size

Table 2 shows the reported amount of effort invested by PMOs in all forms of acquisition documentation and reporting, as well as median program office size in terms of in-house, full-time-equivalent (FTE) professional staff.[1]

Table 2. Effort invested by each program management office in documentation and reporting[a]

Navy	=	1.5 man-years	(In-house PMO FTE	= 20.0)
NAVAIR[b]	=	4.0 man-years	(" "	= 21.0)
NAVSEA[c]	=	1.0 man-years	(" "	= 18.0)
SPAWAR[d]	=	1.0 man-years	(" "	= 25.5)
Army	=	2.5 man-years	(" "	= 38.0)
Air Force	=	2.5 man-years	(" "	= 50.5)

a. Median values.
b. Naval Air Systems Command.
c. Naval Sea Systems Command.
d. Space and Warfare Systems Command.

The data prompt several observations:

- Documentation and reporting consume a significant fraction of total in-house effort within program management offices. In the case of NAVAIR it is about 19 percent, plus some unknown additional burden sustained through the use of contract support services. In the case of the Army, the apparent burden is about 7 percent, but the Army uses contract support services for this function, too, and at about the same level as NAVAIR. Thus, the real burden for the Army is undoubtedly higher than the apparent 7 percent. The Air Force data require some interpretation, as noted below, but the actual burden is probably on the order of 10 percent. (Unfortunately, only relative measures of use of contract support services for this function are available, not absolute amounts.)

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[1] All numbers shown in table 2 in this category are medians rather than means. In analyzing quantitative data from the producers' questionnaire, CNA has consistently used medians rather than means as a measure of central tendency. Because of the relatively small sample sizes and the wide range of values found in the answers provided, a few "outliers" could badly distort a mean.

- NAVAIR expends more effort in-house then do the other two Navy Systems Commands, a result of NAVAIR's much lower, but still significant, dependence on contract support services for this function. (The Navy has taken steps to augment staffing of NAVSEA program offices in order to reduce dependence on contractor support.) It seems a reasonable assumption, however, that if the differential use of contract support services were taken into account, the documentation and reporting burden in NAVSEA and SPAWAR would approximate that of NAVAIR.
- The overall reporting burden is more severe in the Navy because of the relatively small size of Navy program offices.
- In-house staffing of Army program offices is nearly 50 percent greater than the Navy's, and the Air Force's staffing is about two and one-half times that of the Navy.
- The Navy compensates for this lower staffing level with a greater reliance on contract support services.
- The Air Force expends surprisingly little in-house effort (in total) on documentation and reporting (a median value of 2.5 man-years). The Air Force also has an extremely low relative level of dependence on contract support services for this function. This result is almost certainly a case of a misleading median value; the mean value was 7.5 man-years. An actual value somewhere between the median and mean values is supported by the more detailed data in tables 4 and 5, following.

B. Burden on Senior Program Management

Table 3 shows the percentage of time senior program management officers (the program manager and his deputy, the class desk/engineering officer, the business and financial manager, and the procurement contracting officer) spend in preparing and reviewing documents and reports. Incidentally, the data displayed in table 3 (and in table 2) do not include the effort involved in internal Service briefings, POM/budget drills, or pre- and post-Defense Acquisition Board actions.

Table 3. Percentage of senior program management officers time spent in preparation and review (median value)

Navy	-	25 percent
NAVAIR	-	30 percent
NAVSEA	-	23 percent
SPAWAR	-	18 percent
Army	-	10 percent
Air Force	-	15 percent

Clearly, the senior staff of program offices in the Navy spend a substantial percentage of their time dealing with documentation and reporting requirements. These data support the premise of the original tasking memorandum that the "paperwork burden" is a serious drain on program management's attention and effort. Again, the impact seems most severe on the Naval Air Systems Command. There are several possible explanations for this phenomenon, but almost certainly one of them is that NAVAIR places much less reliance on contractor support services for this function than do the other Navy Systems Commands.

The lower percentage of senior management time devoted to the paperwork burden in the Army and Air Force is probably due to the much larger in-house staffs available to their program managers; more of the burden can be delegated to junior personnel. (The study team's first-hand observation of the operations of Navy program offices and their more limited experience with Air Force program offices support this hypothesis.)

C. Preparation Effort and Time for Approval of Specific Reports and Documents

Tables 4 and 5 display median values for in-house preparation effort and time, as well as time for approval, for the ten key status reports and decision documents, by military department. (Times for approval were measured after the report or document had left the originating program office and include reviews within the parent Service as well as in the Office of the Secretary of Defense. Recycle time for rejected documents was also included.)

The data in tables 4 and 5 show considerable variation. As might be expected, status reports are much less demanding than decision documents. Even within these two major groupings, there are substantial differences among the individual reports and documents. Moreover, the differences seem in many cases to be Service-unique.

Various plausible hypotheses can be advanced to account for these differences, but lacking further study, they can only be educated guesses. Similarly, there appears in general to be an intuitively appealing, but unanalyzed, inverse relationship between the effort and time devoted to report and document preparation and the time required for approval.

What is quite clear is the notably lower in-house man-hours devoted to report and document preparation in the Navy compared with the Army and Air Force. In this case, the explanation almost surely involves the Navy's generally greater reliance on contract support services for this function.

The median values used in tables 4 and 5 mask the wide range of estimates in the 85 questionnaires that were returned. The full range of these data are shown in appendix A.

In summary, CNA found that:

- Program managers and their staffs devote significant amounts of time to the preparation and review of even this selected group of status reports and decision documents.
- The Army and the Air Force use substantially more in-house man-hours (at all levels) than the Navy in preparing these ten key reports and documents.
- If the data displayed in appendix A are taken into account, the time and effort involved in preparing the ten key status reports and decision documents show considerable variation among program offices within each of the military departments.

- **There seems to be an overall pattern of, "the more time and effort spent on report and document preparation, the less time required for review and approval."**

D. Duplication and Overlap

Both in the responses to the questionnaires administered to report producers and in our examination of status reports and decision documents, we found duplication and overlap, especially in the content of status reports.

Table 4. Preparation effort and time for approval: status reports[a]

	SAR[b]	CDS	UCR	DAES
Man-hours to prepare				
Air Force	280	40	35	75
Army	200	44	14	40
Navy	80	38	27	20
Weeks to prepare				
Air Force	8	2	1	2
Army	4	1	.5	1
Navy	4	1	1	1
Weeks for approval				
Air Force	4	2	3	4
Army	5	3	4	3
Navy	8	4	4	2

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a. Median values.
b. See list of abbreviations in table 1.

Table 5. Preparation effort and time for approval: Decision Documents[a]

	TEMP[b]	DCP	SCP	AP	COEA	Base
Man-hours to prepare						
Air Force	490	1,325	450	600	190	250
Army	520	310	800	300	500	198
Navy	300	205	160	167	500	30
Weeks to prepare						
Air Force	24	20	8	12	18	8
Army	16	10	26	8	19	4
Navy	23	12	12	12	19	2
Weeks for approval						
Air Force	20	12	20	14	10	16
Army	14	4	8	11	4	5
Navy	26	18	12	12	12	8

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a. Median values.
b. See list of abbreviations in table 1.

Program managers reported strikingly similar reactions concerning data sources for reports, report overlap, and possibilities of eliminating some reports:

- o At least 75 percent of the data in three of the primary status reports (Unit Cost Report, Congressional Data Sheet, and the Defense Acquisition Executive Summary) is readily available in other documents.
- o In the Army and Navy, 35 percent or less of the data in three of the primary decision documents (Development Coordinating Paper, Test and Evaluation Master Plan, and Cost and Operational Effectiveness Analysis) is readily available in other documents. In the Air Force, more than 35 percent of the data called for in two of these documents--the DCP and the TEMP--is readily available in other documents.
- o The most frequently identified cases of overlapping involve the combination of the Selected Acquisition Report, the Defense Acquisition Executive Summary, the Unit Cost Report, the Congressional Data Sheet, and the baseline.
- o Program managers believe that three of these status reports--the DAES, UCR, and CDS--could be eliminated with little impact on OSD or Congressional oversight, and that DAES could be eliminated without adverse impact on their own Service.

CNA's analysis of the ten key status reports and decision documents found that program managers' perceptions of considerable overlap in the content of documents, especially status reports, was well founded. Moreover, there was a burdensome lack of consistency in definitions, formats, and procedures among the reports.

II. Defense Enterprise Program Status Provides Little Relief

The burdens described above are real. Yet the Defense Enterprise Program--which was designed to streamline and reduce reporting burdens in certain selected programs--provides little actual relief.

The Defense Enterprise Program was established by Congress in the Fiscal Year 1987 National Defense Authorization Act, section 905, now Title 10 United States Code (U.S.C.) Section 2436. According to 10 U.S.C. Section 2436, DEPs are programs designated by the Secretaries of the Military Departments, which, "except as specified by the senior procurement executive of the military department concerned, with the approval of the Under Secretary of Defense for Acquisition, ...shall not be subject to any regulation, policy directive, or administrative rule or regulation, policy directive, or administrative rule or guideline relating to the acquisition activities of the Department of Defense other than the Federal Acquisition Regulation and the Department of Defense Supplement to the Federal Acquisition Regulation." Section 2436 further states that this exemption "shall not be construed to limit or modify the application of Federal legislation relating to the acquisition activities of the Department of Defense."

The fact is, however, that 16 of the 22 most important DOD-wide acquisition documents and reports are required by law, FAR, or OMB Circular. Furthermore, of the six remaining self-imposed requirements, four would not willingly be given up by program managers because of their management value. Consequently, for these documents, the benefits of DEP status are largely illusory.

The analysis done for this study showed that DEP program managers face other problems as well:

- Functional specialist organizations within each of the military departments are reluctant to relinquish their department-unique reporting requirements (the "once-burned..." syndrome).
- A heavy briefing workload is involved in keeping buying command, sponsor, secretariat, and OSD offices informed. Program managers consider these briefings to be essential to protect their programs.
- DEP program managers are unable to make a real "contract" for program stability, even with approved baselines. The exigencies of the budget process make it impractical to "fence" stable DEPs at the expense of less stable but more important programs.
- DEPs are a special target for reductions in acquisition personnel, presumably because they have been "freed" of so much of their reporting burdens.

III. There Are Significant Inconsistencies in the Requirements for Baselines and Deviation Reporting

The concept of baselining--which involves a formal specification of, and agreement to, key program parameters and "baseline" values--is not new. The SAR has included a particularly strict form of baselining for many years. The Air Force has had an internal baselining system since at least 1983. The Army, too, has, in the past, used a baseline control system of its own design. While the Navy has not had a baseline document per se, it has controlled baseline aspects of programs (cost, schedule, and performance characteristics) through the use of internal Program Management Proposals.

Currently, there are a variety of statutes, directives, instructions, and policies that relate to baselines and deviations from those baselines. Baselines of some type, as well as criteria and mechanisms for reporting deviations from those baselines, are specified in 10 U.S.C. Section 2432, Selected Acquisition Reports; Section 2433, Unit Cost Reports and Unit Cost Exception Reports; Section 2435, Enhanced Program Stability; and Section 2437, Milestone Authorization for Defense Enterprise Programs.

In addition to these Congressionally mandated baselines, many of which have different data elements, deviation thresholds, and reporting mechanisms, OSD has implemented the concept of baselining through a variety of directives, instructions, and policy letters. These include DODD 5000.45, DODD 5000.1, DODD 5000.2, DODI 5000.50, DODI 7220.32, DODI 7000.3, and DODI 7220.31--plus USD(A) memoranda of 9 February 1988 and 7 March 1988 and their policy attachments.

Program managers thus are faced with interpreting baselining guidance found in four statutes and eleven separate DOD documents. At the time CNA's analysis was performed, the 15 separate pieces of guidance called for similar but not the same data elements, different thresholds for deviations, different mechanisms for reporting deviations, and different consequences resulting from deviations.

Clearly, the program manager is in a difficult position, from both a narrow technical aspect and a broader managerial perspective. Technically, the program manager must know and understand all of the rules and nuances of the complex and inconsistent baselining and deviation reporting requirements. From the broader managerial perspective, baselining may not bring the program stability, streamlined chain of documentation approvals, and decentralized decision authority originally envisioned by the Packard Commission. The Commission envisioned baselines as promoting program stability by allowing program managers to manage within the confines of agreed-upon baseline contracts. Because budgetary changes made in the Planning, Programming, and Budgeting System (PPBS) process are automatic causes for rebaselining, the program manager cannot count on a "contracted" level of resources, and thus a stable program.

The CNA study provides options for resolving or ameliorating most of the technical baselining problems described above. The study did not, however, address the basic policy question of whether the baseline should or can be a method to ensure program stability or whether it should be viewed simply as a device to certify program executability at current funding levels.

IV. Report Users Had Mixed Views Regarding the Usefulness, Quality, and Timeliness of Reports and Documents

Heavy workload, duplicative and overlapping requirements, and inconsistent guidance can increase the vulnerability to error, misinterpretation, and delay. To gain insight into these and other issues, the CNA study team conducted a series of interviews with document and report users in the Navy, OSD, OMB, CBO,and Congressional staffs. The interviewers used a questionnaire designed to probe the users' perceptions of the timeliness, usefulness, and ease of use of the 22 major, DOD-wide documents and reports. Respondents were then asked to choose three or four on which to answer more detailed questions. The questionnaire also solicited more general comments regarding duplication of data and recommendations for improvement.

The documents and reports evaluated by the respondents varied among the various user groups. The only ones evaluated by more than one group were the Test and Evaluation Master Plan (TEMP), the System Concept Paper (SCP) or the Decision Coordinating Paper (DCP), the Congressional Data Sheet (CDS), and the Selected Acquisition Report (SAR).

In general, decision documents (such as the DCP) were seen as very informative, with strong influence over cost, schedule, performance, and acquisition mode. Data in the decision documents were not perceived as significantly overlapping. On the other hand, status reports (such as the SAR, DAES, and CDS) were considered as only moderately informative, noninfluential, and significantly overlapping.

Users were generally satisfied with the format and content of both the status reports and decision documents, except for the SAR. The SAR posed special difficulties--and opportunities--and is discussed in more detail subsequently.

In summarizing the results, the modal response is used for qualitative descriptors and the mean value is used for quantitative responses. These modal and mean values are based on the six documents or reports that had five or more respondents. Some highlights follow:

- The average amount of time used in reviewing the documents or reports varied from 0.8 hour for the CDS to 11.3 hours for the TEMP to 13.3 for the DCP.
- Only the CDS had a modal response of "Never" to the question concerning the need for additional information, and it scored highest on ease of use.
- The CDS received the lowest mean score on perceived usefulness (except for the "problem child" SAR).
- Only the TEMP was reported as having relatively unduplicated information whereas, of the six reports or documents evaluated by five or more respondents, only the DAES was judged to have sections that could be eliminated without loss of significant information.
- Only the TEMP and DCP were considered very informative--but the TEMP was easily the low scorer on timeliness.
- As might be expected, only the Acquisition Plan was a frequent driver of action with respect to system cost, schedule, performance, and acquisition mode.

The basis for these and other findings related to users' perceptions is presented in table 6.

Congressional staffers expressed dissatisfaction with the organization and content of the SAR. They felt that it does not provide advance warning about program troubles. In addition, they felt the advance SARs are not useful, and that OSD does not provide effective quality control for the SAR. Part of their complaint is that they see different documents (e.g. the SAR, CDS, and budget exhibits) with different numbers for apparently the same programs and parameters. What is not immediately apparent is that somewhat different definitions are used in different documents and the "as of" dates are not always the same. Thus, Congressional staffs feel dissatisfied with the quality and the credibility of the SAR.

OSD interviewees also expressed concerns about the SAR, as well as the DAES and the TEMP. They would like a common data base for the DAES and the SAR, as well as automated production of the SAR. They also expressed concern about a fundamental dilemma of oversight: the conflict between wanting to have all the detailed program data to draw one's own conclusions and the need for a hierarchy of oversight with only exception reports going to the upper levels of management. They were also aware of the long document approval times, particularly for the TEMP, and talked about the need for dual approval chains or the need to limit the amount of time any office can hold a document before approval becomes automatic.

Navy officials were most concerned about the AP. They see a need to simplify the AP approval process. Like OSD, they spoke of parallel "chop chains" and specific time limits for approvals as possible improvements.

In summary:

- Decision documents such as the SCP, the DCP, the AP, and the TEMP (particularly the latter two) were found to be useful, influential, and to have little redundancy.

Table 6. Evaluation of documents and reports by users[a,b]

	SAR	DAES	TEMP	DCP	CDS	AP
1. How much time (in hours) do you devote to reviewing this report/document per issue (on average)?	4.5	4.0	11.3	13.3	0.8	2.4
2. The frequency of issue of this report is:	About right	About right	About right	About right	About right	About right
3. How often do you or people in your office call the originator for clarifying information?	Frequently	Infrequently	Frequently	Frequently	Infrequently	Frequently
4. How often do you call the originator for additional information?	Infrequently	Frequently	Infrequently	Frequently	Never	Frequently
5. Do you consider the report informative?	Moderately	Moderately	Very	Very	Moderately	Moderately
6. Is this report used by your office to prepare other reports or studies?	Yes	Yes	No	Yes	No	No

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a. Only documents and reports with five or more respondents are shown.
b. Entries in rows 1 and 12 are mean values; all others are modal responses.

Table 6. (Continued)

	SAR	DAES	TEMP	DCP	CDS	AP
7. How often do you believe action is taken as a result of this report/document with respect to:						
System performance?	Never	Infrequently	Frequently	Infrequently	Never	Frequently
System cost?	Infrequently	Infrequently	Infrequently	Frequently	Never	Frequently
System schedule?	Never	Infrequently	Frequently	Frequently	Never	Frequently
Contractual/acquisition arrangements?	Infrequently	Infrequently	Frequently	Infrequently	Never	Frequently
8. Do you receive reports that give the same or similar information?	Yes	Yes	No	Yes	Yes	Yes
9. Could one or more sections of this report be eliminated without loss of significant information?	No	Yes	No	No	No	No
10. Is the format satisfactory for your purposes?	No	Yes	Yes	Yes	Yes	Yes
11. Is the content satisfactory for your purposes?	No	Yes	Yes	Yes	Yes	Yes
12. Rank on a scale of 1 (least) to 10 (most):						
Timeliness	4.2	6.5	3.0	4.1	4.6	7.5
Perceived usefulness	4.5	6.2	7.5	7.4	5.6	7.2
Ease of use	5.6	7.6	6.6	7.9	8.0	6.6

- Status reports were found to be less useful and much more duplicative.
- The SAR presented special problems to almost everyone, but the comments indicated it has the potential of becoming a powerful, useful, workload-reducing report.

V. Not All Reporting Burdens Are Unwelcome

While the study established clearly that program documentation and reporting requirements are burdensome and that much of the burden may be unnecessary, we found widespread recognition among program managers that documentation and reporting serve useful purposes.

In particular, program managers expressed to us their recognition that effective communications--particularly appropriately timed briefings--are essential to building support for their programs. They also recognize that program decision documents are necessary and (even to them) useful instruments of management--though they might not always agree with their format and content requirements.

The challenge, then, is to develop agreement on what the documentation and reporting requirements should be.

VI. No Single Authority Controls "The Solution"

If there is to be reform of program documentation and reporting requirements, then a central question is the responsibility and authority for reform.

We found that no single authority controls all elements of the solution.

As mentioned earlier, the CNA study examined 22 DOD-wide reports and documents for their sources of authority. Table 7 shows the outcome. Only six of the reports are purely a result of DOD table 7 requirements. All others stem from statute, OMB Circulars, or the FAR. Thus, any attempt to change or eliminate most reports or documents would involve changes beyond the purview of DOD alone.

In summary, many levels would have to be involved in a comprehensive effort to streamline program documentation and reporting requirements.

- Modest changes are within the authority of the Navy, and some steps were being taken as CNA started the study. We recommended further steps, and those and others are being pursued.
- Some potential changes are within the authority of the Office of the Secretary of Defense, but even here the authority is divided between the Under Secretary of Defense for Acquisition (USD(A)) and the Comptroller. Moreover, DOD-wide changes should involve inputs from, and the informed cooperation of, the military departments.
- Finally, some potential changes--notably in baselining and deviation reporting, and in consolidation of status reports--would require legislation. In Congress, too, some issues are under the jurisdiction of the authorizing committees, and some are under the jurisdiction of the appropriations committees.

Table 7. Originating authority for DOD decision document/status reporting requirements

	10 U.S.C. section	Other
Selected Acquisition Report	2432	
Defense Acquisition Executive Summary		DODI 7220.32
Unit Cost Report	2433	
Unit Cost Exception Report	2433	
System Concept Paper		DODI 5000.2
Cooperative Opportunities Document	2407	
Acquisition Strategy Report	2438	
Common-Use Alternatives Statement		DODI 5000.2
Cost and Operational Effectiveness Analysis		DODI 5000.2
Competitive Prototyping Strategy Report	2365	
Test and Evaluation Master Plan		DODI 5000.3
Mission Need Statement		OMB Circular A-109
Independent Cost Estimate	2434	
Decision Coordinating Paper		DODI 5000.2
Program Baseline Document	2435	
Baseline Deviation Report	2435	
Manpower Estimate Report	2434	
Congressional Data Sheet	2431	
Program Element Descriptive Summary		OMB Circular A-11
Acquisition Plan	2305	
Business Clearance		FAR 1.602
Contract Award Report	2431	

VII. There Is a Basis for Consensus and for Improvement

Finally, we believe that there is a factual basis for reductions in the program documentation and reporting burden, and that there is a basis for consensus on action, at least on limited reforms.

We have identified a number of specific instances in which improvements can be made. Those instances formed the basis for the recommendations we made to the Navy. While we have not provided definitive recommendations for regulatory language or legislation, we have in some instances provided "strawman" drafts to the Navy which could form the basis for discussion and refinement. These "strawman" drafts would reduce the inconsistencies and the reporting burden with which program managers have to cope, yet would not deny users any useful data or insights they now get.

We have also found a receptivity to reform by users. In particular, Congressional staff members indicated that they would be willing to accept reformatting the SAR and abolishing the UCR, UCER, and CDS if the new format for the SAR were negotiated with them. The central point was that the new SAR would have to be complete and credible. They also indicated that they would like to see automation of the SAR for ease of use.

These are grounds for optimism. However, we caution that our analysis did not go far beyond the mechanical aspects of program documentation to the larger issues of tension between disclosure and management flexibility, or to fundamental differences of view on the merits of individual programs. Such tensions and differences are inherent in the acquisition process and are not amenable to improvement through administrative reform.

RECOMMENDATIONS FOR REDUCING THE DOCUMENTATION AND REPORTING BURDEN

As a result of the its study, CNA developed a variety of recommendations, some short term and others much longer term, which if implemented could reduce the documentation and reporting burden now carried by program office personnel. The following are the most important of these recommendations:

- **Resolve inconsistencies in policies and procedures for documenting and reporting baselines, deviations, and penalties.**

  CNA has provided an analysis of the points requiring resolution and has proposed language changes in the relevant statutes and directives. Implementation would require an OSD/interservice/Congressional effort to consolidate and harmonize the revised guidance, an effort that is now underway.

- **Replace several status reports with one report.**

  The study found that there are two basic alternatives for dealing with overall reporting requirements. The first would be a long-term solution: creation of a comprehensive, automated acquisition data base. The second and considerably shorter-term solution, would be to modify an existing report to serve multiple purposes. This solution would ameliorate the problem of report overlap, standardize data elements, and simplify report writing, scheduling, and deviation reporting for program managers. In addition, it would help eliminate the apparent inconsistencies found in similar but separate reports.

  SARs contain most of the data elements found in other status reports. Since users are concerned with the ease of use, completeness, and reliability of the data in the SARs, reformatting to address these concerns could make the data more useful. For example, the addition of an executive summary would make the SARs more accessible to a broader range of Congressional staffs and could be of greater use to Members themselves. The second part of the SAR would continue to provide all of the details now furnished in the current SAR, plus certain additions from other reports. Automation of the SARs would help with both preparation and use.

  A reformatted SAR could replace a number of reports, including the old SAR, the UCR, the UCER (while retaining the SECDEF certification portion), and the CDS. If done appropriately, it could also meet the baselining requirements of 10 U.S.C. Section 2435. Based on the interviews conducted, CNA believes a reformatted SAR would be well accepted if it were complete and credible.

  Recommendations for reformatting the SAR resulted in a "strawman" model. Table 8 provides a proposal for Part A of the new SAR, the Executive Summary. Table 9 describes Part B, the detailed supplement for staff analysis. As is obvious from these two tables, no categories of data called for in the other current reports would be eliminated.

- **Examine potential changes for decision documents.**

  While complete elimination of any decision document is not desirable, several changes are worth examining. The format and content of major decision documents such as the MNS, SCP, DCP, TEMP, and AP are not prescribed by law. Changes for most of these documents are within the authority of Under Secretary of Defense (Acquisition) to make since DODI 5000.2 prescribes them. (Even the AP prescribed in the FAR is amenable to some format and content change.) Greater consistency of data elements, content, and format would surely facilitate their preparation and use, with a consequent reduction in workload and potential for error.

  Greater consistency between decision documents and related status reports would also be desirable to facilitate tracking between decisions and results. Developing specific suggestions would require considerable additional research, and CNA has not yet attempted this work.

- **Simplify and speed up the review and approval process.**

  CNA's questionnaire results show long review and approval times, particularly for decision documents such as TEMPs and APs. The streamlined chain of decision approvals does not always lead to a streamlined approval chain for documentation and reporting requirements. Enforcement of a streamlined document approval chain would provide relief initially to DEP managers. The principle could then be considered for selective application to non-DEP programs.

Another change would involve further selective delegation of approval authority within the Services from their Secretariats to PEOs.

Adoption of a "silence is assent" policy could greatly shorten approval times, particularly for decision documents.

Since program managers indicated that the time needed to gain approvals is more of a burden than the report itself, this policy could be effective in the near term.

- **Provide aid to Navy PMO staffs for document and report preparation.**

  Navy PMO staffs are small. It might be appropriate to augment those staffs by considering such actions as program office consolidations and personnel shifts both within and among the Systems Commands. This would be especially necessary if the use of contractor support to handle a growing workload remains an issue.

  Other suggestions include providing program managers with automated tools for acquisition planning, and providing formal training to PMO staffs in report preparation, especially the large and difficult TEMPs and APs.

TABLE 8

PROPOSED NEW SAR FORMAT--PART A (EXECUTIVE SUMMARY)

	NEW SAR	DATA CURRENTLY CONTAINED IN SAR	CDS	UCR	SEC. 2435
1. Designation and nomenclature	X	X	X		
2. DOD component	X	X	X		
3. Mission and description	X	X	X		X
4. Program highlights (including basis for FY 19BY budget request and graphs of selected measures of funding and costs)	X	X	X		
5. Baseline description					
a. Performance goals	X	X*			X
b. Technical characteristics and configuration	X	X*			X
c. Total development costs by fiscal year	X	X*			X
d. Schedule of development events	X	X*			X
e. Number of end items by fiscal year	X	X*			X
f. Testing events	X	**	X		X
g. Initial training	X				X
h. Initial provisioning	X				X
i. Total procurement costs	X	X*			X
6. Baseline deviations	X	X		X	

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* These elements show an original, unchanging baseline estimate, the approved program, and the program manager's current estimate. The proposed new SAR would continue this.

** Not required, but usually included in schedule and highlights.

TABLE 9

PROPOSED NEW SAR FORMAT--PART B (DETAILED SUPPLEMENT FOR STAFF ANALYSIS)

		DATA CURRENTLY CONTAINED IN			
	NEW SAR	SAR	CDS	UCR	SEC. 2435
1. Responsible office and telephone number	X	X			
2. Program elements/procurement line items	X	X	X		
3. Related programs	X	X			
4. Program acquisition cost	X	X	X		
5. Program acquisition/current procurement unit cost summary	X	X		X	
6. Cost variance analysis	X	X			
7. Program acquisition unit cost history	X	X			
8. Contract information (including planned award dates for major subsystems)	X	X	X	X	
9. Program funding summary	X	X	X		
10. Production rate data (revise to include data currently in Congressional data sheets for inventory objectives)	X	X	X		
11. Operating and support costs	X	X			

SUMMARY

In conclusion the CNA study found:

- Documentation and reporting requirements are, indeed, burdensome with considerable variation by report and by Service.

- There is heavy overlap in the content of status reports, with subtle but important differences in data elements and their definitions, as well as differences in formats and timing.

- The relief from reporting requirements offered by DEP status may be largely illusory because a large portion of reporting requirements and acquisition procedures are based in law or FAR/DFAR, and because DEP program managers still need to carry a heavy briefing load.

- There are significant problems in guidance for baselines and for reporting deviations from the baselines, including multiple and inconsistent sources of guidance on the rules for changing baseline values, and the multiple and inconsistent criteria for deviations, deviation reporting, and associated penalties.

- Producers of reports would prefer to consolidate status reports and keep decision documents. They do, however, find the long review and approval times associated with decision documents to be particularly burdensome.

- Users of reports would not do away with any currently available information, but would find reformatting and consolidation of status reports an acceptable solution--if the resultant reports were complete and credible.

- There are a significant number of possibilities for improvement, some achievable in the short term, others requiring a longer-term effort. CNA's recommendations, if implemented, could provide some real and relatively prompt relief to program managers, as well as improve products for the end users of acquisition-related reports and documents.

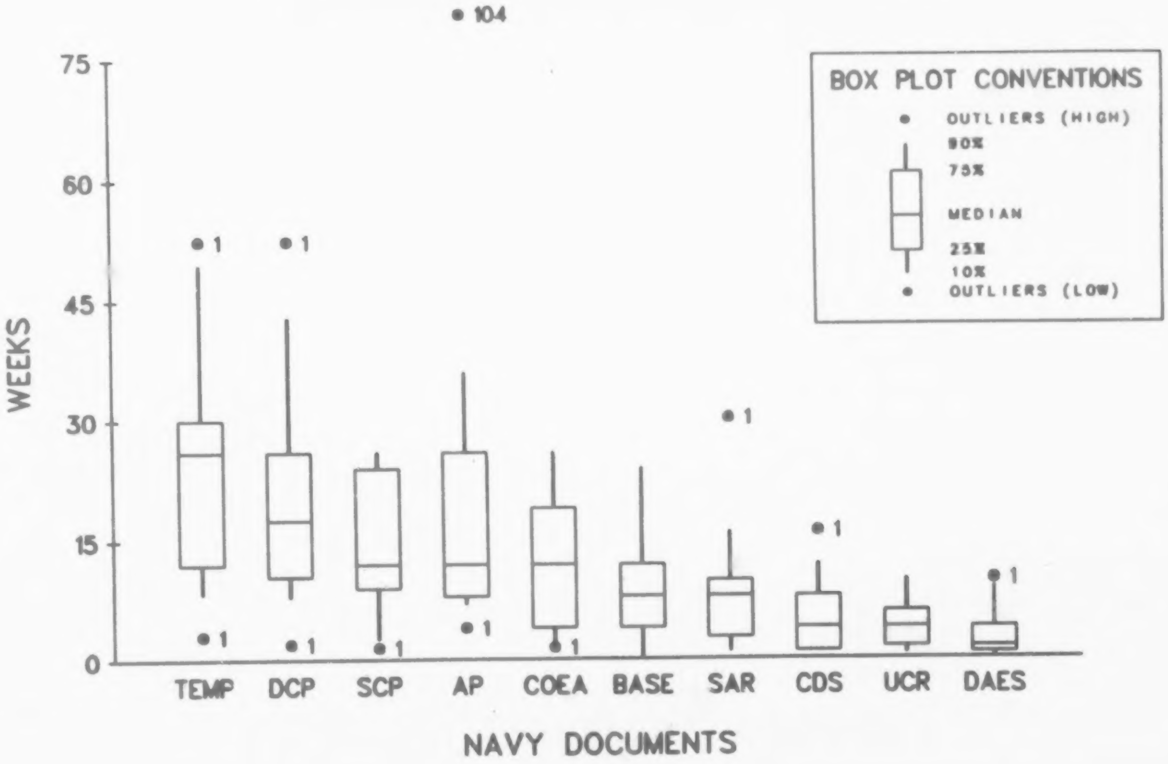
Mr. Chairman, this concludes my statement. I would be pleased to respond to questions.

APPENDIX A

A CNA questionnaire was administered to program managers and their staffs to determine their views of the documentation and reporting process. Among other items of information, the questionnaire elicited estimates of the amount of time and effort spent on preparation and review of ten key DOD-wide documents and reports. These so-called producer questionnaires were completed by 45 Navy program offices (with all three major hardware systems commands represented), 25 Air Force Program offices and 15 Army Program offices.

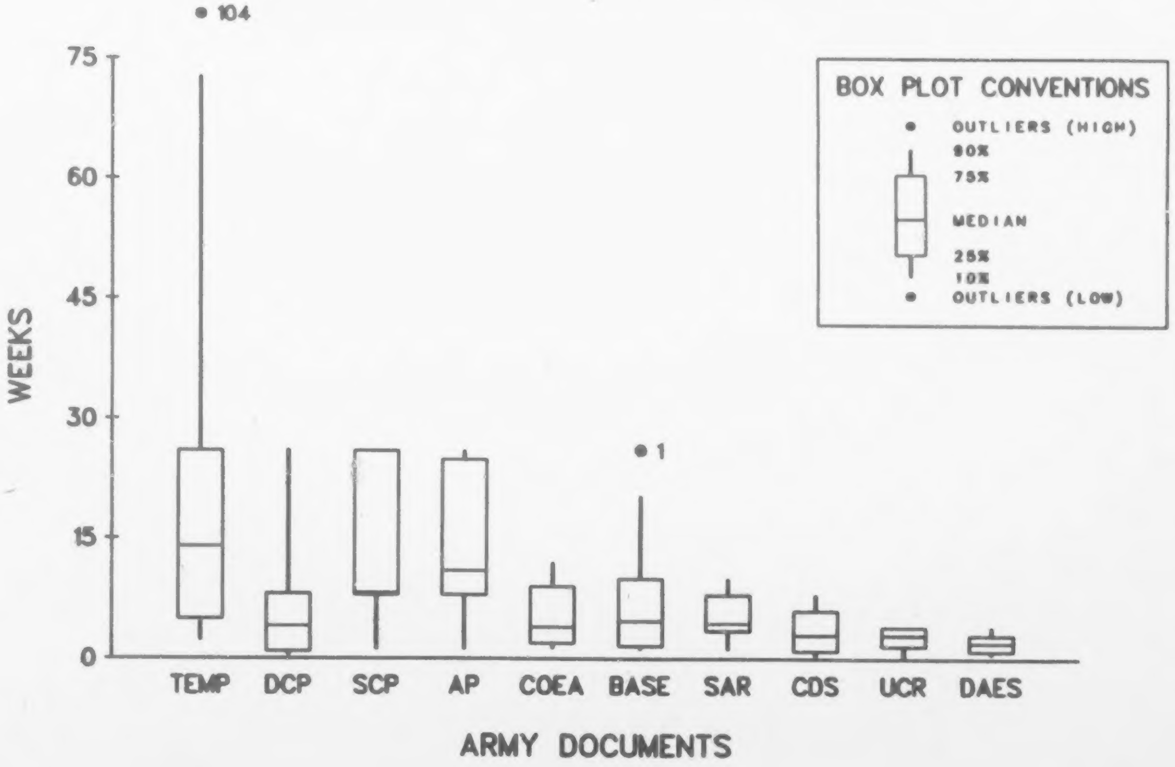
Appendix A contains nine charts that provide a detailed summary of the program management offices' estimates of preparation effort and time and time required for approval. The data are summarized using the so-called box-plot technique. For each measure, for each military department, and for each status report and decision document the box plot format provides: (a) median values, (b) 25th and 75th percentile values, (c) 10th and 90th percentile values; (d) individual high and low outliers within the range of the vertical scale, and (e) the value of outliers beyond the scale of the vertical axis.

TIME REQUIRED TO COMPLETE REVIEW AND/OR APPROVAL PROCESS [a]



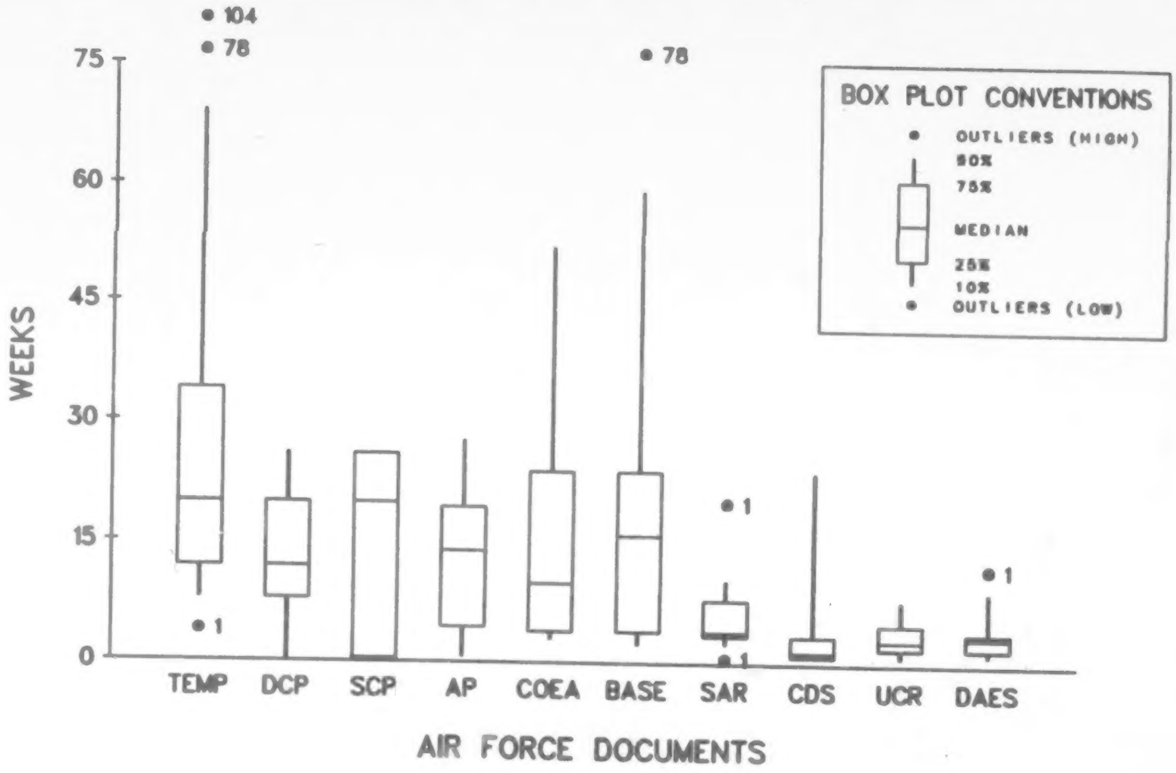
[a] BASED ON 45 TOTAL RESPONSES FROM NAVAIR, NAVSEA, AND SPAWAR

TIME REQUIRED TO COMPLETE REVIEW AND/OR APPROVAL PROCESS [A]



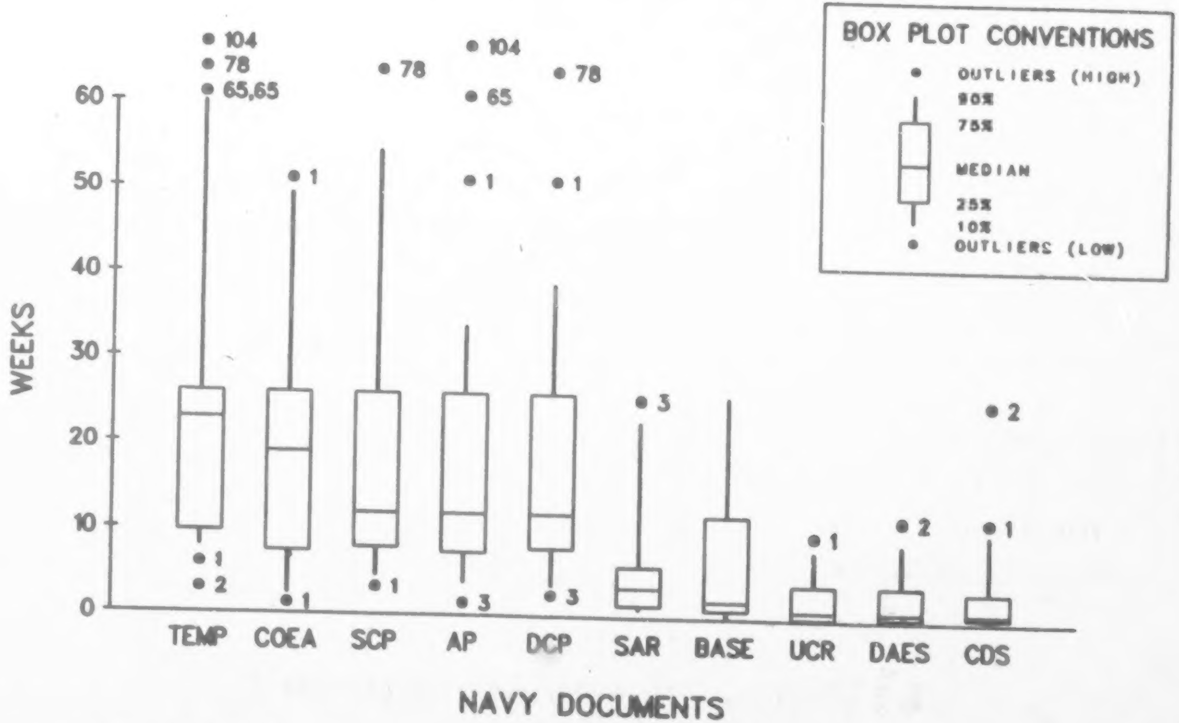
[A] BASED ON 15 TOTAL RESPONSES FROM THE ARMY

TIME REQUIRED TO COMPLETE REVIEW AND/OR APPROVAL PROCESS [a]



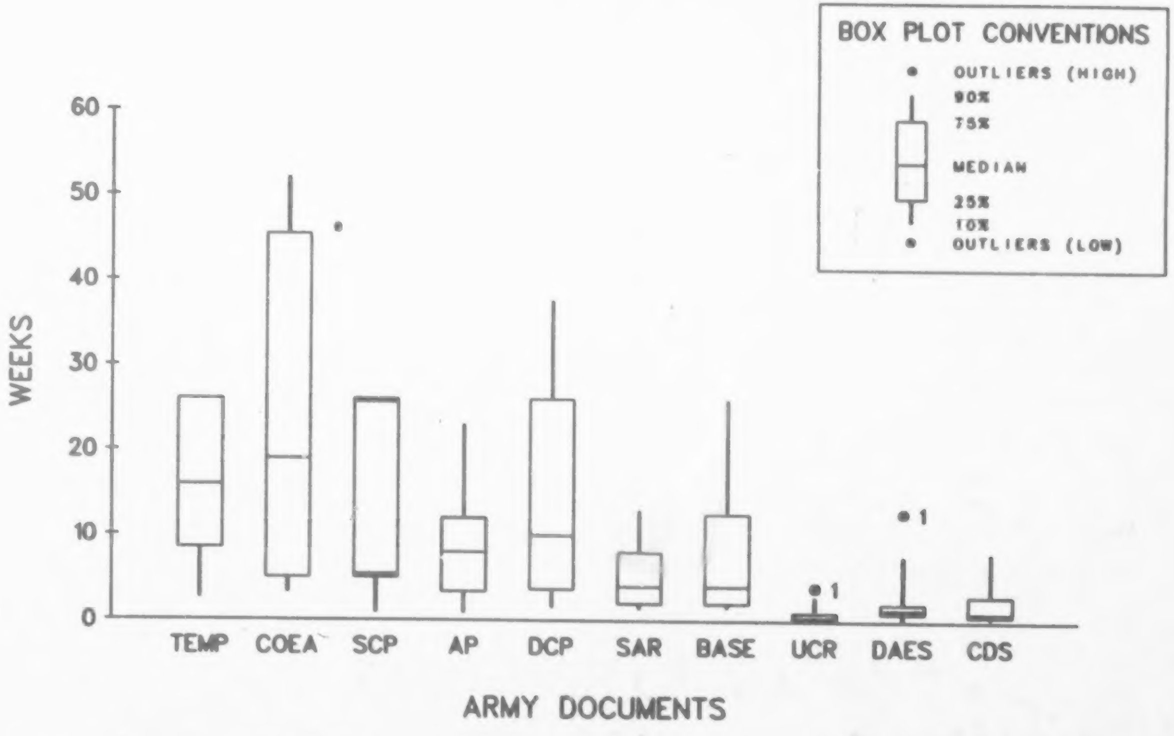
[a] BASED ON 25 TOTAL RESPONSES FROM THE AIR FORCE

TIME REQUIRED FOR PREPARATION OF DOCUMENTS BY PMO [a]



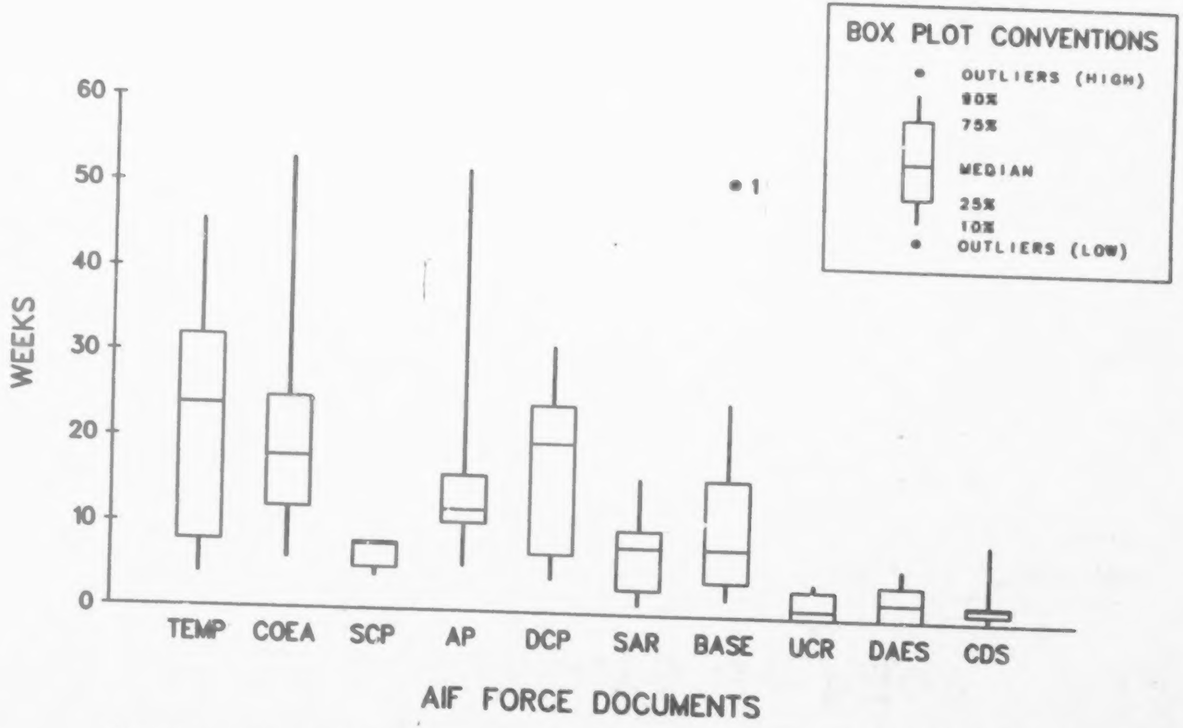
[a] BASED ON 45 TOTAL RESPONSES FROM NAVAIR, NAVSEA, AND SPAWAR

TIME REQUIRED FOR PREPARATION OF DOCUMENTS BY PMO [A]



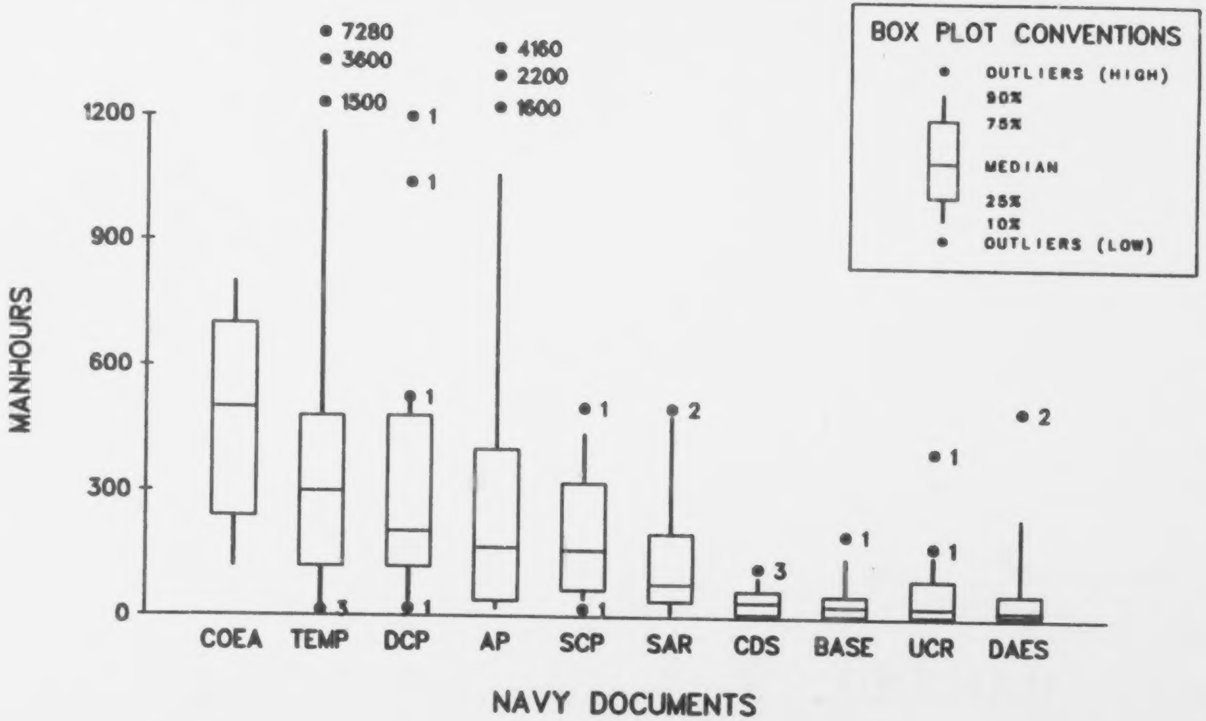
[A] BASED ON 15 TOTAL RESPONSES FROM THE ARMY

TIME REQUIRED FOR PREPARATION OF DOCUMENTS BY PMO A/



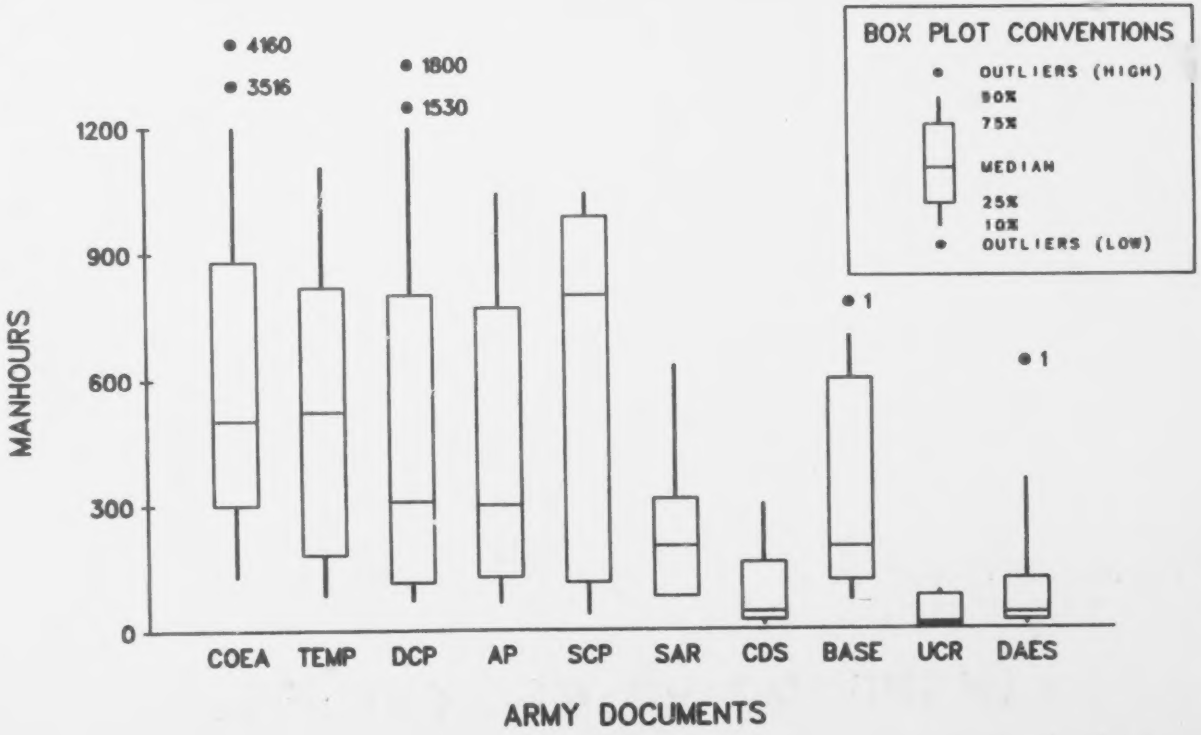
A/ BASED ON 25 TOTAL RESPONSES FROM THE AIR FORCE

IN-HOUSE MANHOURS REQUIRED FOR PREPARATION OF DOCUMENTS [A]



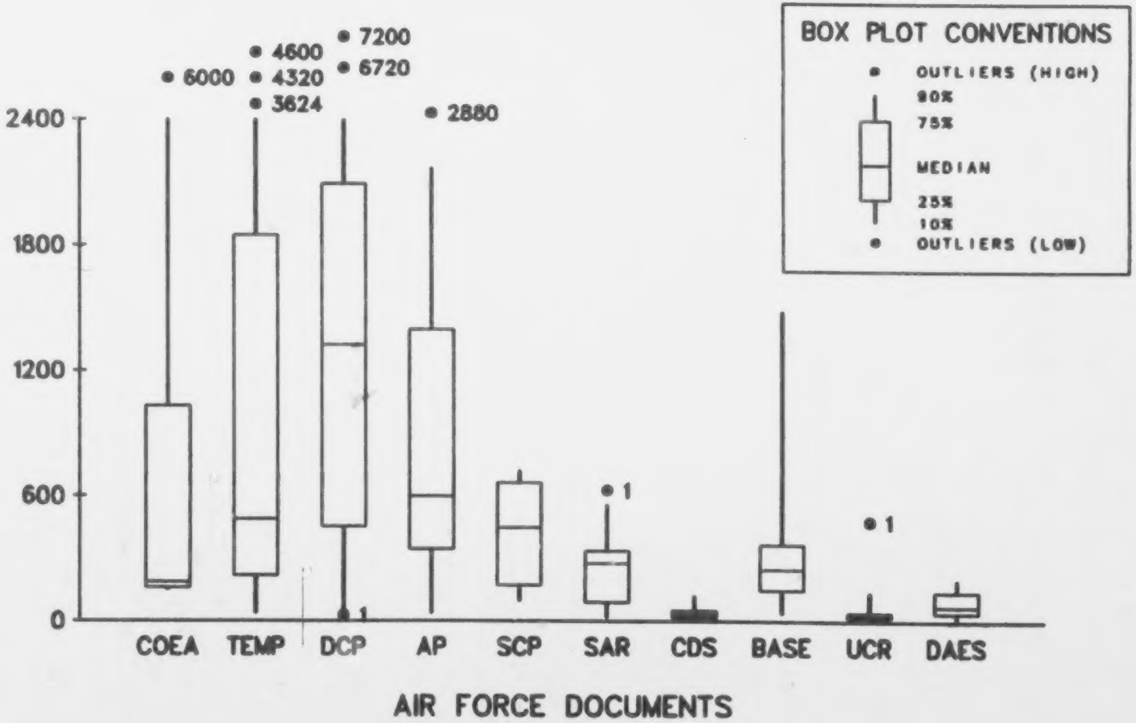
[A] BASED ON 45 TOTAL RESPONSES FROM NAVAIR, NAVSEA, AND SPAWAR

IN-HOUSE MANHOURS REQUIRED FOR PREPARATION OF DOCUMENTS [a]



[a] BASED ON 15 TOTAL RESPONSES FROM THE ARMY

IN-HOUSE MANHOURS REQUIRED FOR PREPARATION OF DOCUMENTS A/



A/ BASED ON 25 TOTAL RESPONSES FROM THE AIR FORCE

Senator **Bingaman**. Thank you very much. Before we ask you questions, I would like to call on Dr. Graham to give his testimony, and then we will have a series of questions for both of you.

STATEMENT OF DR. DAVID R. GRAHAM, ASSISTANT DIRECTOR, STRATEGY, FORCES AND RESOURCES DIVISION, INSTITUTE FOR DEFENSE ANALYSES

Dr. **Graham**. Thank you.

Last summer and fall, I worked with a number of my colleagues at IDA on a review of the defense acquisition process and how the process has changed since the Packard Commission back in 1986. Our findings are documented in a report titled Defense Acquisition: Observations Two Years after the Packard Commission, which describes the progress that we have seen in the process, along with remaining problems, and lays out an agenda for further change.

I have submitted for the record the executive summary from that report, and in my remarks today I would like to just briefly describe how we did the study and highlight some of our recommendations.

Senator **Bingaman**. That will be fine. We will include the entire report summary in the record. Thank you.

Dr. **Graham**. First of all, I would like to make three points about the study itself.

The study was commissioned by the Office of the Under Secretary for Acquisition, who wanted an Independent review of how the process was working at that time and what changes had occurred. They asked us to provide an agenda that could be useful to the next administration in further implementing acquisition reform. They thought it would be particularly beneficial to take advantage of any window of opportunity for change in the early days of a new administration.

Our approach to the study was first to take the basic management principles outlined in the Packard Commission report and use those as benchmarks for evaluating how the system was working and the changes that had been made. We reviewed internal DOD documents to look at the formal changes in the system; in addition, we conducted about 125 interviews with people both inside DOD and outside observers. In our interviews we asked people how they felt the system had changed, whether the changes that they saw were an improvement, and what additional changes they felt were needed.

Our report provides the status of the systems as of about October of last year, and the report represents IDA's views, not necessarily the views of DOD or any of the people that we interviewed.

In structuring our analysis, we looked at four broad issue areas. The first was DOD acquisition organizations. Second were the major decisionmaking processes, including the Defense Resources Board and the Defense Acquisition Board. We looked at the processes for policymaking and regulation, and we then looked at the management responsibilities of the Under Secretary for Acquisition with respect to the acquisition work force and the technology and industrial base.

Because the focus of our study was limited, there were a number of related issues that we didn't look at such as at the ethics issue. And we did not examine a number of specific contracting policy issues, such as profit policy or IR&D policy.

Let me turn now to our main recommendations and findings in these four areas, beginning with organization.

In our reading of the Packard Commission report, we found that Packard basically espoused two principles in the area of organization. The first was to centralize policymaking but decentralize execution of policy, and the second was to streamline organizations and shorten chains of command.

Our review showed that significant changes in DOD organization have occurred, in particular, the creation of the Under Secretary for Acquisition and his organization, and the services have implemented the service acquisition executive—PEO—program manager positions.

But we found that there was a need to strengthen and clarify the roles of the two major actors Packard identified in the acquisition process—the Under Secretary for Acquisition and the program managers.

In our report we suggested that a top priority for the Secretary of Defense should be to clarify the role of the Under Secretary, that the Under Secretary should be among his top advisers on resource allocation issues, and that the Under Secretary should be the Secretary's point man or prime agent for acquisition policy and oversight.

With respect to the program manager, we suggested some regulatory changes that would essentially shift the burden of proof in program decisionmaking, giving the program manager the lead on making program decisions and implementing an appeals process that would allow the other people in the process to participate but without granting them power to veto decisions of the program manager.

In the area of decisionmaking processes, the Packard principles were, first, to budget to provide adequate and stable funding for acquisition programs and, second, to make informed cost performance tradeoffs. And the Commission explicitly stated that the Department should use technology and innovation to reduce the costs of weapon systems.

Related to this, they indicated that there was a need for greater involvement by joint military organizations and also a need to more extensively employ prototyping and testing in acquisition programs.

Our recommendations in this area were, first of all, that early in the administration the Secretary should seek executive and legislative agreement on stable defense funding—some progress seems to have been made in this area—and that the Secretary should request an overall review of the affordability of the acquisition programs that are currently ongoing within the Department.

As a longer range agenda item, we believe the Secretary should direct the Under Secretary for Acquisition to improve the long-range planning for acquisition programs, to look at all programs and investment areas to come up with an affordable overall program.

And our final recommendation in this area is that the Secretary should use his oversight in the Defense Resources Board and should delegate authority to the Under Secretary of the Defense Acquisition Board to better discipline acquisition decisionmaking.

The third area we looked at was policy and regulation. Here the Packard principles were to simplify and unify regulation, to deregulate in order to delegate more authority to people at the working level, and third, to promote commercial practices.

We had two specific agenda items here. The first is for the Under Secretary to aggressively support defense enterprise programs as a means of deregulating on a program-by-program basis.

Second is to eliminate barriers to commercial-style competition. One specific recommendation there is to support the Blue Ribbon approach that has been adopted by the Air Force. Another is to support the proposed legislation that would substitute commercial marketability for military specifications in buying nondevelopmental items.

And finally, in the longer term, we believe that the Under Secretary should take the lead for a comprehensive review of regulation and also the associated training requirements for the people working in the field.

The final area we looked at was management of acquisition personnel and the technology and industrial base. In both areas, we felt the Packard principles advocated more purposeful management on the part of OSD in these areas.

Our first recommendation for personnel management is that a senior acquisition staff member be assigned to take the lead and monitor acquisition personnel management issues, and beyond that, the Under Secretary's organization should make an effort to upgrade and standardize criteria for acquisition personnel, for both military personnel and civilians within the acquisition work force.

And finally, we believe that it would be very beneficial to consider incentives to retain top program managers, within the military, beyond the time when they would ordinarily retire.

With respect to the technology and industrial bases, we found that Under Secretary Costello had begun a number of initiatives that show promise. Two examples are his industrial base initiatives and his total quality management initiatives; the next administration should follow up on these.

In addition, we believe that the Under Secretary and the Defense Acquisition Board should periodically conduct strategic investment reviews for the industrial programs.

In concluding, I have three general observations about the implementation of the Packard Commission recommendations.

The first is that while much remains to be done, in all fairness, DOD has, in fact, accomplished quite a bit in the last 2 years. Some fairly significant changes have occurred.

The second observation is that the formal mandates given to the Department of Defense by both the President and Congress have been fulfilled. DOD has done the things that they were told to do, but in the sense of implementing the spirit of the Packard Commission and they would like to see management practices change within the Department, much remains to be done.

I think the final observation, one of the important lessons we gained during the past 2 years, is that making acquisition reform work within the Department requires, probably more than anything else, a strong commitment and leadership on the part of the Secretary of Defense.

That concludes my remarks.

[The prepared statement of Dr. Graham follows:]

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EXECUTIVE SUMMARY

In its 1986 report, the Packard Commission called for radical change in the defense acquisition process and made recommendations in several areas: organization, decision making, policy, and management.[1] President Reagan and the Congress directed the Department of Defense (DoD) to implement nearly all of the Packard Commission recommendations. Consistent with this guidance, two Under Secretaries for Acquisition, Richard Godwin and Robert Costello, have attempted to implement acquisition reform within the DoD following distinctly different approaches. This study describes what has been accomplished over the last two years and proposes an agenda for continued improvements.

The assessment of the current process is intended to reflect the extent to which DoD decision-making and business practices embody the following management characteristics as proposed by the Packard Commission.

- **Organization** - A streamlined organization with centralized policy making and decentralized execution;
- **Decision Making** - Processes that
    - Provide adequate and stable funding,
    - Make informed cost-performance trade offs that yield "affordable" programs,
    - Involve military operators in decisions, and
    - Employ extensive prototyping and testing;
- **Acquisition Policy** - Simplified and unified acquisition regulations and policies that delegate authority to the working level; and
- **Management** - Policies that promote excellence in the work force, and ensure an adequate technology and industrial base.

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[1] *A Quest For Excellence*, Report of the President's Blue Ribbon Commission on Defense Management, 1986.

These management characteristics represent ideals for the defense acquisition process. Implementing them requires fundamental changes that in many cases conflict with longstanding DoD practices, and long-held beliefs. Making these changes would have been difficult in any circumstances. Additional impediments arose because the mandates of the President and Congress in support of the Commission recommendations were not specific in several areas, allowing broad interpretation, and because the Commission proposal came too late in the Administration to override existing working relationships.

Despite these impediments, many improvements have been made in the defense decision making and acquisition process. While some officials maintain these changes have fully implemented the Packard Commission recommendations, they have not *yet* made the fundamental changes in DoD practice required to implement the Commission's basic philosophy.

This assessment is based on over 100 interviews with OSD, Service, and JCS officials, and other acquisition authorities. The interviews were complemented with a review of documents and publications describing the evolution of the acquisition process and the views of acquisition experts. The determination of what additional improvements might be possible is derived in large measure from interviewees' opinions of what additional changes are feasible and beneficial. Since opinions were mixed, this determination necessarily is partly subjective, reflecting the judgments of the study team.

The experience of the last two years suggests some lessons for fully implementing the Commission's reforms.

- Implementation of the Packard Commission's goals requires major changes in DoD *practice*, but not necessarily in organization.
- Implementation requires the active support of the Secretary of Defense as well as the Under Secretary for Acquisition.
- Quick action at the beginning of the new Bush Administration is critical--particularly because Congress will be watching to see whether the next administration is committed to defense management improvements.
- The Secretary's and Under Secretary's reform agenda must be specific, particularly in areas where there is a clash between Packard Commission philosophy and DoD practice.

In some areas, the experience suggests that progress is being made and will continue if senior officials continue to push in that direction. It also suggests the need to pursue specific near-term actions within the broad organizations presently in place. The agenda summarized below (and discussed in Chapter VIII) is therefore intended to resolve ambiguities in functions and authorities, simplify acquisition policy and oversight within each Service, improve the Under Secretary's ability to advise the Secretary on long-term acquisition issues, provide a more disciplined decision-making environment, and ensure high-level emphasis on the areas of regulation and management. Many of the recommendations relate to the ongoing functions of the Secretary and Under Secretary for

Acquisition; several require new initiatives.

It should be noted that some important acquisition issues were not extensively covered in this review. The most important of these involves ethics, and has made front page news recently. This issue is discussed in dealing with personnel management issues, but it was not made a major focus of the study because of the belief that the problem is more one of enforcement than of the operation of the acquisition system.[2] Secondly, while the Packard Commission emphasized that improvement in the acquisition process requires substantial changes in national-level decision making within the Executive Branch and Congress, the main focus of this study is on the issues and problems with decision making within the Pentagon. Finally, because this review focuses primarily on procedural and organizational issues, there are a number of substantive acquisition-policy issues that are not dealt with here. These include such areas as profit policies, allowable costs, independent research and development funding, tax and depreciation treatment, and progress payments.

A. ORGANIZATION

The Packard Commission found that responsibility for acquisition policy in the DoD had been fragmented, and that program managers responsible for acquiring new systems had not been given the authority they needed to do their jobs. The Commission recommended that DoD create an Under Secretary of Defense for Acquisition and establish a short chain of authority--for acquisition matters--with no more than two layers between the Defense Acquisition Executive and the program manager. In each Service, the intermediate positions would be occupied by one Service Acquisition Executive and a number of Program Executive Officers, each of whom would supervise several program managers. Although these positions have been established, program managers still find that they lack authority commensurate with their responsibilities: they must placate many parties outside the "streamlined" acquisition chain to keep their program going.

The Packard Commission also found that success in new programs depends on "an informed trade off between user requirements, on one hand, and schedule and cost, on the other" and that the Defense Systems Acquisition Review Council was not a good forum for *challenging requirements* and making such trade offs. It therefore recommended creation of a new body representing both military users (who have special insight into operations) and acquisition/technology experts (who have expertise in what requirements imply for schedule and costs). This body would make both "affordability" decisions (how much is a new military capability worth?) and "make-or-buy" decisions (should the U.S. develop a unique item or buy something similar that already exists?) for joint-Service and appropriate single-Service programs.

DoD established the Defense Acquisition Board (chaired by the Under Secretary with the Vice Chairman of the Joint Chiefs of Staff as vice chairman) and the Joint Requirements Oversight Council (chaired by the Vice Chairman). These new organizations and positions have created an organizational structure that is adequate for making informed acquisition decisions. However, in practice, neither of these bodies provides the dialogue on trade offs between military users and acquisition/technology experts or the regular practice of challenging requirements that the Commission sought. Both consider acquisition issues one, or a few, systems at a time rather than in a strategic context.

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[2] One change that has been made in response to the recent scandal is to change contracting procedures to eliminate multiple rounds of best and final offers from competing contractors.

The Commission also recommended streamlining of the organizations within OSD and the Services. Organizational changes have been made, but the management concept of centralized policymaking and decentralized execution has not been put in place.

In sum, the progress made in defense organization, the problems that remain, and a suggested agenda are as follows:

Progress:

- The Under Secretary's authority has been defined by law. He has shaped his staff to provide integrated decision-making and policy-making support.
- The Defense Acquisition Board has been formed with the Under Secretary and Chairman and the Vice Chief of Staff of the JCS as the Vice-chairman.
- A Vice Chairman of the JCS has been created; this office provides a focal point for participation by military operational commanders in the DAB and JROC. The Chairman of the JCS represents them in the DRB.
- The Services have reorganized their acquisition organizations.

Problems:

- In practice, the Under Secretary's authority in "matters of acquisition" is weakened by successful appeals to the Secretary or the Deputy Secretary.
- The Commission's recommended shift of OSD staff functions from involvement in program management to broader planning and policy issues has been slow to occur.
- The Services' reorganizations have generally not increased program managers' authority. Program managers consequently see little difference in their jobs.
- None of the Services has created a central full-time authority for acquisition policymaking.
- No progress has been made in limiting the involvement of Congressional Staff in detailed defense decisions and policies.

Agenda:

- The Secretary should delegate acquisition policy authority to the Under Secretary for Acquisition. To signal the Under Secretary's preeminent role, he should also revise directives (including 5000.1, and 5134.1) to strengthen the Under Secretary's functions within current organizations; and establish clear working relationships among senior acquisition officials, to include coordination among Secretary of Defense, Deputy Secretary Defense and Under Secretary Defense for Acquisition before the Under Secretary Defense for Acquisition issues major decisions.

- The Secretary should act to standardize and simplify acquisition oversight and policy responsibilities within the Services.
- The Secretary should revise directives to clearly establish the program manager's decision authorities, and eliminate management involvement by staffs at all levels.
- The Under Secretary should emphasize the strategic planning roles of his staff, and delineate their oversight responsibilities.
- The Under Secretary should review his staff for possible reductions if he finds the Service's acquisition chains of command can fulfill for him responsibility for program oversight.
- The Secretary should direct the Under Secretary and Service Acquisition Executives to consult with Congress in developing a plan for reducing the micro-management of programs by Congressional staff, and for consolidating reporting requirements.

B. DECISION-MAKING PROCESSES

The Packard Commission found that DoD was not employing technology to reduce cost as has occurred in the private sector, and stated that DoD should use state-of-the-art technology only when essential to meet military needs. The Commission also said that the only consistently reliable means of learning about such benefits and risks was via building prototypes that embodied the new technology. The Commission therefore recommended that DoD build and test prototypes to demonstrate new technology and provide a basis for realistic cost estimates prior to entering full-scale development. It also recommended that DoD begin operational testing early in advanced development, using prototype hardware.

Although the Commission believed that prototyping had not been sufficiently emphasized for several years, interviewees in DoD contend that prototyping has been going on all along, albeit at the component and subsystem level more often than at the system level. Experience since the Commission's findings is mixed: of the three major defense programs that have been approved for demonstration/validation since the Commission Report was published, one is slated to develop competitive fighter and engine prototypes, another will require competitive subsystem prototypes, a third plans no competitive prototyping. The Commission also believed that DARPA should play an expanded role, especially in technology areas OSD believes are not adequately emphasized by the Services. Interviewees at DARPA think that they have had a good record of prototyping both before and after the Packard Report; however, DARPA funding has not been increased to support a larger role.

The Packard Commission noted that DoD has suffered from instability in both top-line funding and funding for particular programs. Several recommendations were offered for stabilizing the overall defense budget through improved national-level strategy and planning, and longer-term Congressional commitments to funding support. To produce stability at the program level, the Commission recommended "baselining," "milestone authorization," and "multi-year procurement." Baselining involves drawing up a "contract" between the program manager, others in the acquisition chain, and those that provide the funding. The contract specifies system characteristics, cost, and schedule. Milestone authorization entails Congressional approval to proceed with a particular phase of a program. Multi-year procurement involves asking Congress to authorize funding not for a single year but through the production phase of a particular high-priority program. Secretary Carlucci has recommended a substantial number of programs for multiyear procurement in the FY1990 budget, however little headway has been made in implementing baselining and milestone authorization.

Within the DoD decision-making process, our review indicates that the Chairman and Vice Chairman of the JCS now have ample authority and opportunity to provide a joint military perspective in acquisition decision-making. The Under Secretary for Acquisition also has adequate influence over resource-allocation decisions through his participation in the Defense Resources Board and the Defense Acquisition Board. Within these organizations, the Under Secretary can advise the Secretary on the links between acquisition decisions and resource decisions in order to achieve a coherent acquisition program. His current role is consistent with the general view that overall resource decisions must be made by the Secretary, and that acquisition decisions must follow from, not dictate, resource decisions.

The Department can further the Packard Commission goal of improving acquisition decisions by improving long-range planning and by disciplining the decision-making processes to adhere to the Secretary's guidance. To aid in this process, the Under Secretary should eliminate two deficiencies in the current decision-making framework. First, he should develop longer-range acquisition plans, because the five-year defense planning time horizon is too short for "affordability" assessments. Second, he should work with the Services to develop mission area plans, major product area plans, and technology area plans. These analytical tools would serve as a basis for issuing a Defense Guidance that provides a meaningful long-range plan for acquisition programs, which are grounded in strategy and consistent with realistic resource projections.

In sum, the progress made in defense decision making, the problems that remain, and a suggested agenda are as follows:

Progress:

- The national security planning process has been changed to promote stability by increasing planning realism:

  (a) It incorporates budget constraints in developing force projections for the Defense Guidance, and

  (b) Secretary Carlucci has set more realistic budget projections as a basis for planning.

- The Chairman of the JCS, the Vice Chairman of the JCS, the CINCs, and the Joint Staff are playing a larger role in acquisition and resource allocation, potentially increasing the influence of military operational commanders in decision making.
- The Under Secretary advises the Secretary in the Defense Resources Board and chairs the Defense Acquisition Board, giving him the potential to link resource allocation decisions and acquisition program decisions.
- The Services are better defining "requirements," expressing them initially (Milestone 0) as broad mission needs rather than in terms of specific hardware parameters.
- Prototyping has raised important issues in recent Defense Acquisition Board reviews of the Advanced Tactical Fighter and the Army's Light Helicopter.
- Improvements in Operational Test and Evaluation have been achieved in recent years.
- Live-fire testing has led to survivability improvements in the Bradley fighting vehicle; it promises to improve programs if applied judiciously.

Problems:

- National budgeting instability undermines DoD procedures designed to promote program stability:

  -- Months into the planning cycle, the FY 89 plans and programs were undermined when the projected budget was cut by 10 percent to meet Gramm-Rudman spending limits.

  -- Current planning projections of 2 percent real defense spending growth are probably overly optimistic, providing an unsound basis for current acquisition planning.

  -- Actions to stabilize individual programs are also undermined by the recent substantial changes in the budget.
- Despite Packard Commission recommendations, Congress has not issued five-year budget guidelines, nor has it adopted two-year defense budgeting as as a means to stabilize defense budgets.
- There is no systematic framework in place to assess long-range affordability and cost-performance trade offs. As a general practice, the DAB examines programs one-at-a-time so it cannot consider broad affordability and trade off issues, and the primary DRB focus extends only one to five years into the future.

Agenda:

- The Secretary and the Chairman of the JCS should review the defense program and budget with the President and Congress as soon as possible after taking office in order to achieve an agreement on stable defense funding.
- In support of his overall program review, the Secretary should direct the Under Secretary and the DAB to review the ongoing acquisition program and offer alternative acquisition programs that meet conservative fiscal guidance.

- To promote program stability in the longer term, the Secretary should enforce a long-range strategic approach in the acquisition decision-making process, and direct the Under Secretary to develop better long-range planning tools.

  (a) The Secretary of Defense should direct the continued development of long-range planning estimates to provide a framework for assessing long-term affordability, there by permitting informed cost-performance trade offs.

  (b) The Under Secretary, in conjunction with the Chairman of the JCS, should develop long-range investment area assessments that should form a basis for developing the Defense Guidance.
- The Secretary should use the Defense Guidance as a strategic planning tool, and discipline the resource-allocation process and acquisition process to comply with it.
- The Under Secretary should use the Defense Acquisition Board to discipline the acquisition process; in particular he should ensure consideration of options that meet the mission needs and funding goals specified in the Defense Guidance.

C. POLICY AND REGULATION

The Packard Commission made several recommendations in the field of acquisition policy. It proposed replacing existing laws governing the process with a single greatly simplified statute. The Commission said that DoD should expand use of commercial-style competition. It argued for increased reliance on commercial products and recommended requiring a waiver before hardware could be uniquely developed for military use. Finally, it recommended that DoD change technical data rights policy to make it easier to purchase off-the-shelf hardware.

DoD has enjoyed some success in implementing the Packard recommendations just described. It has revised its technical data rights policy along the lines the Commission suggested. It has undertaken some initiatives that permit DoD buyers to more systematically take into account the past performance of potential suppliers and to avoid exhaustive inspection of suppliers that have maintained high standards. DoD has started to simplify regulations and to experiment with de-regulation of acquisition for Congressionally-mandated Defense Enterprise Programs.

In other areas, Packard recommendations have not been implemented and do not appear likely to be implemented. The Services continue to operate their own acquisition systems with separate directives, regulations and handbooks, sometimes lacking consistency even within the Services. The uniform procurement statute has been drafted but is given little chance of passage on the Hill. Waivers are not required to develop an item, and no one we interviewed judged such a waiver to be a good idea.

In still other areas, progress has been slow and much more needs to be done. One noteworthy example is that although a presumption in favor of commercial products whenever militarily appropriate has recently been established in law, regulation still mandates use of military specifications.

In sum, the progress made in defense regulatory policy, the problems that remain, and a suggested agenda are as follows:

Progress:

- DoD has revised its regulations concerning rights in technical data, which will make it easier to purchase some off-the-shelf items.
- DoD has taken some steps to simplify regulations.
- DoD has made some progress toward increased use of commercial-style competition.
- The Air Force has a promising approach for Defense Enterprise Programs.
- DoD has completed a study that recommends ways to improve management of DoD specifications and standards.
- DoD has established a Pilot Contracting Activities Program to identify and test regulatory simplification and taken steps to standardize government specifications.

Problems:

- Regulations have not been made uniform across the Services.
- Improved training and incentives for acquisition personnel are needed to reduce barriers to the use of commercial-style buying practices, and to make other regulatory reforms.

Agenda:

- The Under Secretary and the Service Acquisition Executives should develop more uniform regulations. and require that they are uniformly interpreted and applied.
- The Under Secretary should aggressively support Defense Enterprise Programs as a vehicle for experimental changes in regulations.
- The Under Secretary should strive to eliminate barriers to the use of commercial-style competition and the use of commercial products wherever militarily appropriate; training and better information should be stressed as the means to do this.

D. MANAGEMENT OF PERSONNEL, TECHNOLOGY AND THE INDUSTRIAL BASE

The Secretary's management of personnel, technology programs, and programs and policies relating to the technology base and industrial base are among his most important responsibilities. The Packard Commission and other recent studies have found significant problems and long-term neglect in managing the infrastructure. In the area of personnel management, there now are calls for radical changes in DoD organization that are intended to improve the skills, experience, independence, and accountability of individuals in the acquisition work force. In the area of science and technology there is national level concern that the US leadership in key military technologies is declining. In the area of the industrial and technology base, there is concern that domestic defense manufacturers often lag in productivity growth and that not enough is being invested in reserve emergency capabilities.

The Packard Commission specifically recommended new procedures for the compensation and management of civilian acquisition personnel. In addition, the Commission recommended that DoD improve the US capability for industrial mobilization. The Under Secretary is the principal advocate for these programs, but they are not always supported because their payoffs are indirect and long term. Greater attention is being given to them, but in most areas measurable change has not occurred.

In sum, the progress made in defense management, the problems that remain, and a suggested agenda are as follows:

Progress:

- The Services have made modest progress in training skilled program managers.
- Frameworks for better strategic planning in science and technology programs have been proposed.
- Under Secretary Costello has launched initiatives that if implemented could improve key process technologies, increase the productivity of defense manufacturers, and improve quality.
- Planning for industrial surge and mobilization is improving.

Problems:

- Program managers and their staffs do not always have the training and experience needed to assume the leadership role proposed by the Packard Commission.
- Progress in civilian personnel management is stymied by the unwillingness of the Office of Personnel Management to upgrade contracting officers to professional status, and by a general lack of commitment to develop highly skilled business managers.
- Proposals for extending the "China Lake Experiment" in flexible personnel management to additional facilities have not been adopted by Congress.
- No solution has been found to the dilemma presented by "revolving door" restrictions--how can managers experienced in defense acquisition be drawn from the private sector when they are restricted from returning upon completion of their government assignments.
- In the absence of an effective strategy and priorities, it appears too little is being invested to systematically address deficiencies in the defense industrial base.

Agenda:

- The Under Secretary should upgrade and standardize the criteria for experience, education, and training for all (military and civilian) acquisition personnel.

- The Secretary should direct the Under Secretary to establish program management career incentives to retain experienced program managers.
- The Under Secretary should assign a senior staff member to monitor programs and developments in acquisition personnel management.
- The Under Secretary together with the Defense Acquisition Board should conduct an annual strategic review of infrastructure programs relating to science and technology programs and the industrial and technology base. This review should provide a basis for setting priorities for needed investments for inclusion in the Defense Guidance.
- The Secretary should work with the Executive Branch and Congress to develop improved "revolving door" legislation that meets the publics concerns with ethics while reducing the financial barriers to government service.

E. IMPLEMENTATION

The prompt actions of the President and Congress in response to the Packard Commission's recommendations showed high-level commitment to changing the process. and suggested that dramatic changes in the process might be forthcoming. Upon closer inspection, however. it is clear that the specific changes ordered were narrow organizational ones, and that much of the burden of acquisition reform rested on the shoulders of the DoD leadership--with the Under Secretary for Acquisition at the point. Given that the new Under Secretary came into an administration in which many of the top officials had been on the job for up to six years, one should not have expected his job to be easy.

Although this review shows that, on balance, the acquisition system has made modest improvements over the past two years, it also finds that significant additional improvements are possible--within the current organization and under current law. Many of the basic problems identified can be solved if two steps are taken. First, the Secretary must delegate the Under Secretary for Acquisition sufficient authority to discipline the decision making processes for acquisition matters both in the Office of the Secretary of Defense and the Military Departments. Secondly, the internal reforms, which are the focus of this report should be accompanied by reforms in Congress. The Congress must structure itself so that it can better perform its oversight functions without disturbing orderly acquisition programs. In sum, this review concludes that the solutions to many of the basic problems with the acquisition process are within the authority of the Secretary or Under Secretary. but their implementation will require relentless high-level support.

Senator BINGAMAN. Thank you very much. Let me ask a few questions, and then I will defer to Senator Wallop.

This Defense Enterprise Program—I am interested in what appears to be a conflict between the two testimonies we have. Dr. Brandt, you indicated that you think it has provided little relief because most of the reporting requirements are statutory.

Dr. BRANDT. Well, we looked at a very narrow portion of the reporting requirements. For the reporting requirements we looked at, Defense Enterprise Program status certainly would have provided little relief. We did not look at the other requirements that exist in program offices, and there are dozens if not more than dozens of requirements.

The one observation we possibly could make was that it is very difficult to trace the source authority of documents, even for these major documents. It is unclear, certainly from the program level where the program manager is going to be asking for a waiver from some of these requirements, where the requirement originated from. And without knowing that, it is very hard to use the DEP program, which says you must comply with statute and FAR and DFAR, to know what you can and can't ask for a waiver to or get a waiver from.

I wouldn't want to generalize and say that all of those requirements that are left are caused by statutory authority or a FAR or a DFAR, but it is very difficult to know where they do originate from. And I would suggest that probably there is a tangle of statutory and FAR and DFAR authorized requirements left in the program office.

And, again, we did look at the DEP program offices some time ago, but there seemed to be little relief at that time in those offices from some of these requirements.

I think what Mr. Graham said is that there is the possibility for relief, and that still might exist.

DEFENSE ENTERPRISE PROGRAMS

Senator BINGAMAN. Dr. Graham, you say here on page 11 of your testimony that one of your recommendations is: "The Under Secretary should aggressively support Defense Enterprise Programs as a vehicle for experimental changes in regulations."

How does that square with the apparent finding that there is a lot less here than meets the eye as far as actual benefits?

Dr. GRAHAM. Well, again, we are talking here specifically about reporting requirements, and there are other regulations as well that should be considered. When we talked to a representative from the Air Force, he indicated that in reviewing the regulations, they found several hundred that they thought could be waived under this program.

Senator BINGAMAN. Are those being waived in this program now? Are those benefits being realized?

Dr. GRAHAM. No, not yet. This experimental program really hasn't been put into place yet.

Senator BINGAMAN. What is the timetable on this? I thought that there were Defense Enterprise Programs.

Dr. GRAHAM. Well, I'm sorry. There are Defense Enterprise Programs, but what has happened is the Air Force and the Navy have gone back and studied what are the regulations that might be waived under the programs. And as we have heard here, they have identified a number of options. But I don't think that any of these have actually been put into effect yet.

Senator BINGAMAN. When did we start Defense Enterprise Programs? How long ago did we authorize that?

Dr. GRAHAM. Two years ago?

Senator BINGAMAN. I am told 1986, but you are telling me that they have not yet in 1989 determined what requirements can be waived as part of this? How are they operating Defense Enterprise Programs if they haven't made that determination?

Dr. GRAHAM. What I have said is that there have been studies done and there have been candidates identified, but that——

Senator BINGAMAN. Candidates meaning regulatory requirements that they have identified as possibly being available to be waived, but they haven't waived anything?

Dr. GRAHAM. That's my understanding, yes.

Senator BINGAMAN. What are they doing? Are they running Defense Enterprise Programs just like all programs then? Is that basically what you are saying?

Dr. GRAHAM. Well, with respect to regulations, that's my understanding. Yes.

Senator BINGAMAN. With respect to something else, they're doing it differently? What are the differences? If you have a Defense Enterprise Program and a regular program, what is the difference in the way they are actually operating?

Dr. BRANDT. The Navy did move to take some action to benefit the DEP programs. Last year the Under Secretary of the Navy did send out a letter to the DEP program managers and the Systems Commands Program Executive Officers. The Navy letter talked about streamlining the DEP documentation and approval cycle. The Navy has had a steamline chain of command in effect for sometime for all of their major program offices.

The letter also stated that those DEP program offices would not be subject to extraneous regulations or regulations that were not in FAR, DFAR and law. There has been some response from the System Commands, the buying commands where those programs are located in the Navy. The programs have come back and said that they are using that letter on DEPs to provide some relief, in a limited way, from some of their regulations.

We have not studied how that implementation is going, but I do know that the Navy did act last year to attempt to get that moving.

Senator BINGAMAN. What about the Army and the Air Force? Have they done anything to facilitate these Defense Enterprise Programs, or do they just operate them in the way as all other programs?

Dr. GRAHAM. That is my impression.

Senator BINGAMAN. Your impression is, it is just like all programs.

Dr. GRAHAM. Progress has been made in considering candidate regulations that might be waived under these programs—that is the main area that we looked at. There may be other areas where progress has been made.

Senator BINGAMAN. As far as you know between the way we run Defense Enterprise Programs and the way we run regular programs in the Army and the Air Force.

Dr. GRAHAM. Well, in the area of regulation, which is specifically what we looked at, that's right.

Senator BINGAMAN. But the purpose of Defense Enterprise Programs was to eliminate a lot of the regulatory requirements, was it not?

Dr. GRAHAM. That is my understanding, yes.

Senator BINGAMAN. So, you are saying that as far as regulations and regulatory requirements are concerned, they are still the same.

Dr. GRAHAM. Yes.

Senator BINGAMAN. Senator Wallop.

Senator WALLOP. Mr. Chairman, I think what has happened is that you have identified the very human characteristic not unique to bureaucrats but in the current political atmosphere what exists around us. You get in a whole lot less trouble for not having gone far enough than you do for having gone too far. Primarily what you are seeing is an overdose of caution while Congress wraps itself in a sort of era of instability. People are more willing to find fault with the acquisition process than to cure errors within it. That is an important distinction I think.

We have now seen Mr. Stone, the former Under Secretary of the Army and Army service acquisition executive, named as the Acting Under Secretary for Acquisition. There has been no permanent appointment to the post.

Let me just pose a question to each of you. Is time running out for this administration to make the necessary changes, and when does that window of opportunity close? It just strikes me that what we are seeing now is we have a little bit of agreement on what the level of defense spending should be, and to take advantage of that isn't going to last very long. People are going to start designing it for them.

Dr. BRANDT. Well, I wouldn't want to suggest what that window of opportunity is.

I would say that one of the things that we have noticed is that people are, indeed, waiting for new leadership to come in before they make changes in the system, and that has been taking up quite a while. While people are working together, and there are working groups going on attempting to implement some relatively modest changes at least the changes that we have been looking at, there is always the feeling of anticipating the arrival of the next set of leaders who will come in with their own agenda or may want to do something in their own way. I think that has been an inhibiting factor in some of the implementation effort that we have watched from afar.

Dr. GRAHAM. At the OSD level, the President has requested a management review of DOD, and in conducting that review acquisition reform has been seriously considered. The review should be coming out in the not too distant future. So, I don't think that people have been waiting for the new Under Secretary to come on board to address a lot of these issues.

Senator **Wallop**. Addressing them in theory is much different than addressing them in practice. I think what you are seeing now is somebody who wants to be authorized to make some of the recommendations, without undertaking it upon themself—worrying about the specific atmosphere surrounding defense acquisition and the general political atmosphere that Congress finds itself in now.

One of Dr. Costello's initiatives was to seek to work pretty closely and coordinate with General Herres to better integrate the work of the Joint Requirement Oversight Council and the DAB in the requirements development process at the beginning of major acquisition.

Could you, Dr. Graham, characterize the success of that effort? Can we institutionalize any benefits that may have been achieved there?

JOINT REQUIREMENTS OVERSIGHT COUNCIL

Dr. **Graham**. Well, the Joint Requirements Oversight Council is looking at joint programs and candidates for joint programs, and they are participating with the Defense Acquisition Board in the early milestone decision points on those programs.

When we looked at the intent of the Packard Commission, one strong theme was the need for informed cost performance tradeoffs. It is our impression that when the Commission recommended the creation of a joint requirements management board, they envisioned a board that would look at cost performance tradeoffs.

In our review, we found that neither the JROC, the Defense Acquisition Board, nor the Defense Resources Board, as they currently operated, are really structured to make those kinds of tradeoffs.

And our related recommendation is that the Under Secretary, at the direction of the Secretary, institute an integrated, long-range planning process for acquisition programs. This sort of process will provide a more strategic context, for looking at the requirements for individual programs, in the broader context of all of the programs. That approach does not seem to exist today as we think it was proposed for the JRMB.

Senator **Wallop**. Also in your executive summary, you mention that in practice the Under Secretary's authority in matters of acquisition is weakened by successful appeals to the Secretary or Deputy Secretary. I can understand what you are saying, but what is the solution to the problem? It seems sensible to allow the service Secretaries to appeal.

Dr. **Graham**. That's right. And it's really a matter of degree and a question of delegation of authority—let me first distinguish resource allocation issues, which are handled by the DRB, from policy and oversight issues, which fall more under DAB purview.

While a senior and important adviser, the Under Secretary is only one among many on the Defense Resources Board. We think the implications of the Packard Commission regarding the Defense Acquisition Board were that to centralize policymaking, one person must be the force behind acquisition policymaking and enforce that policy through the oversight process.

So, we believe that while the Secretary obviously is the ultimate authority in all matters, that he ought to delegate sufficient authority and back up his Under Secretary in enough cases that everyone realizes the Under Secretary does have clout and he is, in fact, the Secretary's agent in these matters. So, it is, in part, a question of developing a management team and delegating of authority.

Senator WALLOP. You wouldn't prevent the service Secretaries, then, but would rather direct your recommendation to the Secretary.

Dr. GRAHAM. That's right. And, in fact, in our recommendations we talked about changing the 5,000 series of regulations to develop an appeals process. The service Secretaries and other people should always have the opportunity, but they should consider appeals only in exceptional cases, not as a routine matter.

Senator WALLOP. Thank you.

MANAGEMENT REVIEW

Senator BINGAMAN. Let me ask about this management review. I keep hearing that there is a management review soon to be released. When was this requested, or when was this begun, or how long has this been in the works?

Dr. GRAHAM. I'm not certain; I believe since the first of the year.

Senator BINGAMAN. Do you know, Dr. Brandt, who requested it or where it came from?

Dr. BRANDT. I really don't.

Dr. GRAHAM. Well, there was a package of reviews requested by the President through the National Security Council I believe.

Senator BINGAMAN. Is this part of the strategic review?

Dr. GRAHAM. It is related to, but separate from that.

Senator BINGAMAN. But it's the same initiative.

Dr. GRAHAM. Same kind of initiative.

Senator WALLOP. If you will, I hesitate to mention the name, but I think it was initiated by Secretary-Designate Tower.

Senator BINGAMAN. Was this something that Senator Tower asked for?

Dr. GRAHAM. Well, there may be yet another review that Secretary-Designate Tower asked for. That was by an independent individual.

Senator BINGAMAN. And he says it was directed by President Bush.

I guess I'm concerned that since we don't have an Under Secretary and since we don't have a lot of these positions filled, who is going to review this or determine if it is appropriate? Who is conducting this? If it is released, it sort of comes out of the void in the sense that many of the key positions which ought to be involved in the decision or in the review and in the decisions as to management changes are not filled. I just have trouble seeing how you can have a management review that presumably reflects a lot of policy decisions on how DOD ought to function, how you can issue that kind of thing when you don't even have people in the key positions to make those policy decisions.

Maybe one of you could respond to that.

Dr. GRAHAM. Well, I will only say that, as I said in my testimony, I think one of the important lessons gained from the past 2 years is that the real proponent for acquisition reform has to be at the very top of the Department of Defense, the Secretary and his Deputy Secretary acting as his alter ego. So I think that their acting on this issue is probably a positive move.

Senator BINGAMAN. Who is doing this review? Is it being done by the offices of the Secretary and the Deputy?

Dr. GRAHAM. I believe so, yes, and I understand it is being coordinated throughout the Department.

Senator BINGAMAN. Dr. Brandt, do you have any information?

Dr. BRANDT. We haven't been involved, no.

Senator BINGAMAN. You don't know a thing about this.

Dr. BRANDT. Well, I know it's going on, but we have not been involved in any part of it.

BASELINING

Senator BINGAMAN. Dr. Brandt, let me ask you about baselining here. You point out that there is a real problem of conflicting directives, instructions, policy letters, statutes, a welter of conflicting information about how this is to be done. You say there are 11 separate DOD directives on the issue of baselining.

Dr. BRANDT. Or pieces of policy guidance.

Senator BINGAMAN. Yes.

You say the CNA study provides options for resolving or ameliorating most of the technical baselining problems described above, and then over in your recommendations for action by the Congress or by whoever, you say we recommend that changes be made in the relevant DOD directives, sections 2432, 2433, 2435, 2437 of 10 U.S.C. which will eliminate the overlaps and the inconsistencies.

Have you gone the next step and indicated how to revise those to eliminate the overlaps and inconsistencies?

Dr. BRANDT. We put together some draft, or straw-man proposals, which provided some suggested language for legislative changes and some suggested language for the DOD directive changes that you would need for consolidation of baselines and reformulating of the SAR. Those were submitted to the Navy and a proposal—again, these were merely draft, straw-man regulations—was sent to USD(A). A working group is reviewing those proposals. We drafted these proposals after doing the study. That was our first cut at what you might want to do to resolve some of the inconsistencies we found.

Senator BINGAMAN. Are those contained in any of the materials you provided us?

Dr. BRANDT. The only piece that is contained in the testimony that we gave you is a sample format for what we think a reformatted SAR might look like. The rest isn't in there.

Senator BINGAMAN. We are going to do a defense bill here in the next 6 or 8 weeks. Is this working group going to be in a position to make some recommendations to us as to statutory changes that are needed in that period?

Dr. BRANDT. CNA itself has not been following the implementation through the working group that closely. We have been supporting the Navy. I would think that either OSD or the Navy could better answer that question. They certainly know about——

Senator **Bingaman**. Who is head of the working group? Do you know?

Dr. **Brandt**. It would be actually two individuals in OSD. One is Gary Christle in the Comptroller's Office, and the other is Bob Soule in USD(A).

Senator **Bingaman**. Thank you. My time is up.

Senator Wallop.

REQUIREMENTS OF OMB

Senator **Wallop**. Following that just a little bit, tell me some of the requirements of OMB that are in conflict here. They seem to be the one sort of area in which coordination seems least likely.

Dr. **Brandt**. Actually the OMB-required pieces of regulation were not involved in some of the consolidation that we talked about. The two pieces that we found where OMB circulars were source authorities were not overlapping and duplicative in ways where they would be involved in this consolidation. While we did talk to OMB personnel, we didn't talk to anyone at OMB with an eye towards changing or eliminating their two documents. And again, we only looked at 22 documents, a small universe.

Senator **Wallop**. But when you say that any attempt to streamline or eliminate most reports or documents would involve changes beyond the purview of DOD alone, you don't find OMB to be troublesome in that or do you? I'm just trying to find out.

Dr. **Brandt**. As I must say, it would seem to me that if you wanted to make changes in a document that was an OMB circular requirement, you would have to work with OMB. And I have no experience on whether OMB would be forthcoming or not forthcoming or amendable to changes or not. We really didn't look at those two documents in terms of consolidation because they weren't particularly overlapping nor were they perceived as particularly burdensome.

Senator **Wallop**. By the interviewees.

Dr. **Brandt**. Right.

SERVICE ACQUISITION EXECUTIVES

Senator **Wallop**. Mr. Graham, thus far the Air Force, I think, is the only service to have a service acquisition executive who has no duties other than acquisition. Let me ask you two questions.

One, should this be a general requirement to all the services?

And two, could the Navy take this step and preserve the separation they treasure of shipbuilding from other systems acquisition?

Dr. **Graham**. Well, we see a tradeoff between the level at which the SAE operates and how much of his time he can devote to acquisition activities. In the case of the Navy, the Under Secretary level is probably appropriate, even though he would probably serve less than full-time as the SAE.

Senator **Wallop**. The Navy has procurement problems just like everybody else. How can he or she or whoever perform this activity with competence and confidence when he or she has all the other obligations of the Under Secretary?

Dr. **Graham**. Well I think that you must go to the Under Secretary's level to have a span of control over all of the procurement activities within the Department—that is why there seems to be a tradeoff there.

Senator WALLOP. Maybe, then, it becomes unique to the services and their requirements?

Dr. GRAHAM. Well, I think that the optimal level for the SAE could vary among departments, depending on the circumstances. But again, going back to the principle that applies to the Under Secretary for Acquisition, the ultimate responsibility and leadership role has to go to the Secretary of the services, just as it's the Secretary of the Department of Defense.

Senator WALLOP. I don't quarrel with that, but that's a blandism that doesn't help to get to the problems that exist. It seems to me that if you are going to have the concept of a service acquisition executive, then it has to be that person's role. I can't believe that the Navy is so structured that that individual wouldn't have enough to do and that he couldn't be backed up by the Navy Secretary. But to diffuse that responsibility, to give that responsibility in addition to others that are diffused upon that individual seems to me to weaken the whole concept of what was sought in the Packard Commission.

Dr. GRAHAM. Well, Packard did say in particular at the OSD level that the defense acquisition executive should be full time. Again, there is a tradeoff within the services. I'm not sure what the right answer is in the case of the Navy, for example.

Senator WALLOP. Thank you, Mr. Chairman.

Senator BINGAMAN. Dr. Graham, one of your recommendations here is that the Under Secretary and the Service Acquisition Executives should develop more uniform regulations and require that they are uniformly interpreted and applied. How do we in Congress get that to happen?

We have asked for a report from the DOD as to what steps it is taking to streamline the process. It just seems to me that there is a frustration that I feel, and I'm sure a lot of others in Congress feel, that there is this unbelievable mass of regulations, many of them different from service to service, many of them inconsistent.

And the same can be said of some of the statutes, and the statutes we need to take responsibility for not cleaning up. But we need some help from DOD in identifying where the inconsistencies and problems are.

In the area of the regulations and the directives and the policy letters and the instructions and sort of overlap over overlap, it really has sort of a Kafka-esque feel to it. How do you come to grips with it? How does Congress see to it that these things are made uniform and made consistent?

Dr. GRAHAM. Well, in our study we were looking at an internal agenda for the Department of Defense and that obviously was one of the important items on our agenda. If the Department of Defense follows our recommendations in its management review, then this is an area that they are likely to make changes.

Now, how does Congress try to initiate that kind of action from outside of the organization? I suppose that it would come through your oversight review functions.

Senator BINGAMAN. Well, I'm sure that is right, but that doesn't help.

I have been chairing the subcommittee a little over 2 years now and we constantly say to DOD tell us what we need to change. Tell us what you are doing to change. Tell us how we get these problems resolved. We get very little back that is constructive, quite frankly. And so, we are sort of always looking for bits and pieces of things that we can do to improve the system, but surely there are people working in the system who are well aware of vast numbers of things that could be done to deal with some of these inconsistent, nonuniform regulations. Now, how do we get that done?

Dr. **GRAHAM**. What goes on within an agency is driven by the people who hold the key positions in the agencies. There are examples within other agencies where the appointment of someone who was a champion of reform or for changing the direction of an agency has made a real difference with the way the agency operates. Perhaps looking closely at the plans and goals of the next Under Secretary for Acquisition—asking him what he plans to do and expressing your interest in having him look into regulatory issues—might be a way of moving this process forward.

REFORMATTED SAR

Senator **BINGAMAN**. Dr. Brandt, you suggest that we replace several status reports with one report. Now, that is in addition to the reformatting of the SAR?

Dr. **BRANDT**. The reformatted SAR would include several other status reports. It would not just eliminate other status reports, but possibly help with some of those baselining and breaching inconsistencies because in this report, you would have one standard set of baselines, and deviations to those baselines. You would eliminate reports and you would do some consolidation of that baseline inconsistency problem.

Senator **BINGAMAN**. What is the status of that recommendation? Is it also being done by this working group?

Dr. **BRANDT**. Yes, that is in OSD also.

Senator **BINGAMAN**. And you do not know when they might complete their work?

Dr. **BRANDT**. Yes, I really don't know that.

MANAGEMENT ATTENTION

Senator **BINGAMAN**. Did you have any thoughts as to the question I asked Dr. Graham as to what Congress could do to bring more consistency and uniformity to the directives and regulations and instructions and policy letters that exist in each of the departments?

Dr. **BRANDT**. I would only echo Dr. Graham's answer. Management attention is very important to this effort. Having mucked around in this for about a year and a half, I know that this is boring work. It is difficult to go through regulations, and it is difficult to do some of the changes. If you have mangement attention which signals that this is important work that needs to be done, you are likely to get a product at the end of the process. I don't know how Congress would focus that kind of management attention, but where you do find the attention, you are likely to get a product.

Senator BINGAMAN. Let me just check on something here. In order to move us to more use of commercial products, to more commercial practices, is the ball in the court of the Congress to get that done, or is this something where the authority exists and DOD needs to do it? Dr. Graham, what are your thought on this?

Dr. GRAHAM. Well, from talking to people on the House side and talking to people within the Pentagon, I think that there is room for a lot of improvement within the law as it stands today.

One of the complaints you hear from people in the Pentagon is that the appeals process of the Competition in Contracting Act creates a lot of problems for trying to award contracts on any basis other than the lowest price because you are always open to an appeal. The Air Force has come up with one way around that problem by developing Blue Ribbon programs. The people out in the field are given the discretion to award a contract to someone who is not necessarily the lowest bidder, if that contractor has a proven track record and has been placed on a preferred supplier list.

This is the kind of mechanism that helps to clarify the appeals process and could help implement commercial practices. What can be appealed should be clarified and what are good bases for awarding contracts should be communicated to the people out in the field, so that they know how they can adopt more commercial-style practices, award a contract, and still have it be upheld upon appeal.

Senator BINGAMAN. How long has this Blue Ribbon listing been in place?

Dr. GRAHAM. I think that is relatively new. I don't know for certain.

Senator BINGAMAN. It sounds like that is the kind of a thing that Congress had in mind implementing with the Defense Enterprise Programs also, where you identify certain programs that then are encouraged to move ahead in an expedited fashion which do not necessarily have to comply with every procedural step. Is that what you are describing?

Dr. GRAHAM. In this case, it is more of clarifying to the people out in the field what options they have in awarding contracts. The story we have heard is that the law does give them discretion, and the regulations do give a contracting officer discretion in awarding contracts based on, say, a good past performance. But in practice, people just don't exercise this option because it is not clear to them what discretion they really do have.

Senator BINGAMAN. But your information is that there are certain contracts and certain contractors who wind up on this Blue Ribbon. Is that the phrase you used?

Dr. GRAHAM. The Air Force. That's right.

Senator BINGAMAN. Just in the Air Force, not in the other services?

Dr. GRAHAM. That is my understanding, yes.

Senator BINGAMAN. And they have a Blue Ribbon list and those who are on that, they encourage to consider quality as well as cost in allowing contracts?

Dr. GRAHAM. That's right. What it specifically says is that they can award a contract to a Blue Ribbon contractor if his bid is up to 10 percent greater than a bid of someone who is not on that list.

Senator **Bingaman**. And that is contained in a directive or in what?

Dr. **Graham**. Yes. I believe it is an Air Force directive.

Senator **Bingaman**. Is this list of Blue Ribbon contractors public?

Dr. **Graham**. I don't know.

Senator **Bingaman**. But you have seen it.

Dr. **Graham**. I have not seen the list, no.

Senator **Bingaman**. But there is such a list.

Dr. **Graham**. I am told there is, yes.

Senator **Bingaman**. Well, we have a lot of other questions. We may submit some in writing to you for response if we could. We appreciate very much the testimony of both of you. Thank you very much.

The hearing is adjourned.

[Whereupon, at 11:37 a.m., the subcommittee was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEARS 1990 AND 1991

FRIDAY, JUNE 2, 1989

U.S. SENATE,
SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

INDUSTRIAL AND TECHNOLOGICAL BASE

The subcommittee met in open session, pursuant to notice, at 8:32 a.m., in room 232A, Russell Senate Office Building, Senator Jeff Bingaman (chairman of the subcommittee) presiding.

Committee member present: Senators Bingaman, Wirth, Wallop, and Coats.

Committee staff member present: Andrew S. Effron, general counsel.

Professional staff member present: William H. Smith.

Minority staff members present: Jonathan L. Etherton and Judith A. Freedman, professional staff members.

Staff assistants present: Barbara L. Braucht and Melissa A. Ramsey.

Committee members' assistants present: Edward M. McGaffigan, Jr., assistant to Senator Bingaman; Jack D. Crouch II, assistant to Senator Wallop; Charles G. Pearcy, assistant to Senator Lott; and Eric H. Thoemmes, assistant to Senator Coats.

OPENING STATEMENT OF SENATOR JEFF BINGAMAN, CHAIRMAN

Senator BINGAMAN. Good morning. The subcommittee will meet this morning to receive testimony on acquisition policy in the defense technology and industrial base.

Today we will receive recommendations from representatives of the defense industry on how to improve defense acquisition and to make better use of the technology and industrial bases that we have.

This hearing is part of a continuing effort by this subcommittee to promote an interchange of ideas between government and industry.

Over the past several weeks the committee has received testimony from several people who are knowledgeable and experienced in matters of national defense. One common thread that runs through this testimony is that the United States, while still the Free world's leader in science and engineering and defense technology, is in danger of losing that lead. These witnesses have said that the United States must take strong and immediate action in a variety of areas if we are to retain our position as a leader in the Free world.

We need your advice and your recommendations to ensure that the programs undertaken by Congress and the Department of Defense are on the mark and are directed at our most urgent problems.

Today we have five highly-qualified witnesses testifying in two panels. The first panel includes Mr. Frank Lewis of the Harris Corporation, representing the Electronic Industries Association; Mr. Philip Odeen of Coopers & Lybrand, representing the Professional Services Council; and Mr. Frank Menaker of the Martin Marietta Corporation, representing the Defense Industry Initiative working group.

Frank Lewis is the Harris Corporation Senior Vice President and Special Assistant to the Chairman and Chief Executive Officer. In addition, Mr. Lewis is on the board of directors of a number of industry associations, including the Electronic Industries Association. Mr. Lewis will testify on EIA's assessment of the implementation and impact of the Packard Commission recommendations.

Mr. Phil Odeen is a managing partner of Coopers & Lybrand. He has extensive prior experience in the public and private sectors. He served as a principal Deputy Assistant Secretary of Defense for Systems Analysis. He is currently Chairman of the Board of the Professional Services Council. Mr. Odeen will address the concerns of the Professional Services Council over the ability of government to obtain the best value for professional and technical services under current procurement policies.

Mr. Frank Menaker is the Vice President and General Counsel of Martin Marietta. He is also Chairman of the Defense Industry Initiative Working Group on Business Ethics and Conduct. The subject of ethics in the Defense Department and the defense industry, of course, is one of today's most-discussed topics. We look forward to Mr. Menaker's testimony and recommendations in that respect.

Why don't we go ahead with this panel and then after the entire panel has testified, we will have some questions. Then, following that, we have two additional witnesses who will be introduced when that panel begins.

Mr. Lewis, go ahead and begin with your testimony, please.

STATEMENT OF FRANK LEWIS, SENIOR VICE PRESIDENT AND SPECIAL ASSISTANT TO THE CHAIRMAN AND CHIEF EXECUTIVE OFFICER, HARRIS CORP.

Mr. Lewis. Thank you. Good morning, Mr. Chairman and members of the subcommittee. I am Frank Lewis, a Senior Vice President for Harris Corp., a Melbourne, FL headquartered company with annual sales in excess of $2.5 billion.

It is a pleasure to appear before you this morning representing the Electronic Industries Association. The association has over a thousand member companies, including 60 of the largest defense contractors.

I plan to share some thoughts on defense acquisition policy and on the necessity of a thriving commercial industrial base as an instrument of America's national security.

Harris is engaged in advanced research and development, design and production of custom electronics systems for the Government. These programs focus on information processing, communications, and C^3I systems. Harris activities in these sectors are centered on technologies fundamental to the company's objectives in commercial markets.

Additionally, Harris Semiconductor is the largest producer of microchips for Government applications world-wide, and is the country's sixth largest producer of semiconductors.

Mr. Chairman, I have a written statement to submit for the record and with your concurrence, I would like to highlight the conclusions offered in this document at this time.

Senator BINGAMAN. That is fine. We will take all of the written statements as prepared and then anything you can do to summarize those we would appreciate.

Mr. LEWIS. Thank you. EIA's testimony covers several categories of issues of concern to our industry, the impact of restrictions on post-Government employment, and more complete implementation of the Packard Commission's major acquisition policy recommendations.

Regarding post-Government employment restrictions, the association supports the fundamental prohibitions on conflict of interest, as codified in 18 U.S.C. 207 and 208. These sections of the criminal code prohibit certain activities of current and former executive branch civil servants and military officers. The prohibitions run for up to 2 years after leaving Government service and apply to financial as well as experience-related conflicts of interest.

One problem with recently-enacted and proposed changes is that they are held up as solutions to basic problems of dishonesty. Another concern is that post-Government employment restrictions are found in many sections of U.S. law.

In today's climate, the Government is simply not getting the best people. In fact, it is losing them at an increasing rate. We need to attract the best people to government and to keep them there if we are to enhance the quality of products brought into the arsenal of America's defense.

I believe it is necessary to bring relief from counterproductive post-Government employment restrictions to attain these goals.

For these reasons, we suggest that the subcommittee review existing statutes, as suggested by the President's Committee on Federal Ethics Law Reform to determine if certain restrictions can be repealed. At a minimum, EIA urges the subcommittee to consider consolidation of many of the statutes on this subject. Such an action would help clarify their continuing applicability and form the basis for a repeal of conflicting or inappropriate statutes.

Another subject of interest to both Government and industry is the ethics programs guidelines and requirements. Mr. Chairman, I am certain that you and your colleagues are aware of the activities which industry has put into motion, including the Defense Industry Initiative, commonly known as the DII. It should be pointed out that most DOS contractors have had corporate ethics programs in place well before the advent of recent Government or industry proposed initiatives in this area.

This morning I would like to urge the subcommittee to avoid a Government-mandated code of ethics. Mandatory requirements imposed by Congress are not solutions. To the contrary, mandates will eventually lead to standardized approaches which strip a company of the flexibility it needs to match its corporate ethics programs with its unique set of business circumstances. Unfortunately, mandates also necessitate the creation of an additional administrative management layer to oversee and manage the mandates. Ultimately, mandates regress into paperwork requirements and certifications.

I suggest to the subcommittee that there is a significant body of very effective ethics programs already in place and working for our industry. It is entirely appropriate for the subcommittee to encourage the major trade associations to bring forward information on the number of companies which have ethics programs in place and the types of programs that are in existence.

Mr. Chairman, I would like to use the remaining time to share my thoughts on commercial technology, an area which is key to both our national security and economic vitality. In fact, national security and economic vitality have become so closely intertwined as to render one meaningless without the other.

The commercial leaders of America's high technology base face tremendous disincentives in trying to supply the best available technology to the DOD. The requirements of cost-based contracting methods and the extraordinary audit and oversight burdens of DOD business have forced most major manufacturers to segregate the Government and commercial product lines.

Competitive disadvantages, such as unproductive overhead costs and exposure of proprietary costs and pricing data, burden most of our advance facilities and prevent them from effective participation in govenment business.

We need a new culture in the defense acquisition environment, a culture that relies on the genius and cost-effectiveness of America's commercial industrial base instead of hoards of auditors reviewing mounds of costs and pricing documentation. Our written statement will provide the subcommittee with regulatory changes to help along these lines.

One commercial technology area worth noting in this regard is semiconductors, where state-of-the-art technology for commercial end-use is more widely employed commercially than in defense. The impediments to this use, the impediments to the use of the commercial technology, are typically today not product or quality or performance requirements, but accounting barriers. That is, cost-accounting, cost-segregation, cost-certification, cost-allocation, and on and on.

These accounting measures are anachronisms developed in an era when sole-source contracts were more prevalent. In today's competitive environment, these cost-accounting measurements of yesteryear must be re-examined.

The driving force in America's defense and national security policy must be the continued vitality of our economy and the competitive viability of our commercial industrial base. If our national defense strategy is to remain one based on technical superiority, we must find ways to use the more advanced manufacturing and design technologies of the commercial sector.

I believe the subcommittee's goal should be a thoughtful review of the current environment in which government and industry do business, encourage a more productive environment through incentives and removal of impediments. Our Government shoulders a responsibility to encourage a strong and healthy base of commercial industries to supply our national defense needs. EIA is ready to help in any way possible.

Thank you.

[The prepared statement of Mr. Lewis follows:]

FRANK J. LEWIS
SENIOR VICE PRESIDENT
SPECIAL ASSISTANT TO THE
CHAIRMAN AND CHIEF EXECUTIVE OFFICER
HARRIS CORPORATION

Mr. Chairman and Members of the Subcommittee:
My name is Frank Lewis, and I am Senior Vice President and Special Assistant to the Chairman with Harris Corporation. I am pleased to appear this morning on behalf of the Electronic Industries Association to provide the Subcommittee with EIA's views on current developments in acquisition policy and technology and their impact on the defense electronics industry.

My presentation today will focus on two general categories of issues of current concern to our industry: the impact of restrictions on post-government employment as they affect the government's ability to attract and retain quality talent; and more complete implementation of the Packard Commission's major acquisition policy elements. Also, I want to offer a few comments based on EIA's recent analysis of the 22 technologies identified by DoD as key to the defense program.

Regarding complete implementation of Packard Commission recommendations in acquisition policy, I would like to begin with a discussion of our concerns in the areas of post-government employment restrictions, ethics program requirements, commercial products procurement, acquisition streamlining, fixed-price development contracting, and government audit policy.

POST-GOVERNMENT EMPLOYMENT RESTRICTIONS

18 USC 207 and 208 apply certain prohibitions on the activities of current and former Executive Branch civil servants and

military officers. Some activities are prohibited for two years while others are banned forever. The provisions also apply to financial conflicts of interest and make annual reporting a requirement. In essence, they preclude government employees from changing sides in any project they work on. We support these fundamental prohibitions on conflict of interest.

However, the legislative and regulatory focus has changed radically during the past several years. What prevails today is a confused and adversarial environment grounded in punitive, reactive judicial activism. Increasingly, restrictions on post government employment are held up as solutions to basic problems of dishonesty. To the contrary, these restrictions serve mainly to prevent the government from attaining the skilled and experienced people it needs to conduct its business.

Despite the completeness and adequacy of pre-existing revolving door laws, more employment restrictions have been added by the Procurement Integrity Section of the OFPP Act Amendments of 1988 (Pub. L. 100-679). These restrictions make it a criminal and civil offense to make offers of employment to a broad and vaguely defined segment of government employees called "procurement officials." These individuals are also at risk if they solicit offers of employment or future business opportunities from certain government contractors. We have not had a chance to test this new law in action because its implementation date has been delayed from May 16 to July 16. However, the mere prospect of it has prompted a large number of high-ranking officials to leave the government.

Dr. Robert Costello, former Under Secretary of Defense for Acquisition, stated in his letter of resignation: "I have chosen the May 12th departure date after careful evaluation of the restrictions of potential future employment opportunities imposed by P.L. 100-679, the Office of Federal Procurement Policy Act Amendments of 1988. The sacrifices demanded by these statutory employment restrictions, which become effective on May 16, 1989, have forced me to reconsider my strong commitment to public service. As you know, I had offered to stay as long as you wished in order to facilitate a smooth and effective transition. I regret, however, that in light of the implications of P.L. 100-697, I will be unable to remain..."

Dr. Costello is only one of a number of resignations and retirements of significant government managers who specifically cited concerns over the procurement integrity employment restrictions. One senior NASA official stated that "the impact of some upcoming changes on government retirees made it such that I did not get to pick the most desirable or optimum time to retire."

Furthermore, in his May 11 testimony before this Subcommittee, the Deputy Inspector General of DoD Derek J. Vander Schaaf, stated, "-- the basic causes for human error in acquisition matters are inadequate training, excessive personnel turnover, poor morale, and the increasing difficulty in attracting top quality people to public service...."

Let's face it, we're losing the best and the brightest, and the trend will only worsen as new and tighter restrictions either trap people within the government or keep them from entering the government at all.

In today's over-legislated and over-regulated climate, the government is simply not getting the best people. In fact, it is losing them at an increasing rate. Quality of product can only decrease as the quality of people goes down. We need to attract the best people to the government acquisition sector--and keep them there. Over the years, every single study made of the government acquisition process had emphasized this requirement. Most recently, The Packard Commission stressed the importance of attracting and retaining qualified procurement personnel. Congressmen Aspin and Mavroules have endorsed upgrading the criteria for experience, education, and training of acquisition personnel and providing incentives to recruit and retain experienced program managers. But neither the recommendations of the Packard Commission nor the endorsed improvements of Congressmen Aspin and Mavroules can occur without relief from these counter productive post-government employment restrictions.

EIA supports the fundamental conflict of interest prohibitions contained in 18 USC 207 and 208. We suggest the subcommittee review existing statutes as suggested in the Report of the President's Commission on Federal Ethics Law Reform, and determine whether and to what extent some of the revolving door restrictions currently on the books should be repealed. At a minimum, the Congress should consider consolidation of the many statutes on this subject to clarify their applicability and eliminate the inappropriate restrictions which are preventing people from entering government service.

ETHICS PROGRAM REQUIREMENTS FOR DOD CONTRACTORS

We support the Packard Commission recommendations regarding the need for defense contractors to develop and enforce written standards of conduct tailored to their unique needs and problems. Member companies of EIA are not unique in recognizing the special responsibilities and requirements of doing business with the DoD. Our defense electronics membership has in place codes of ethics and business conduct which reflect the size and level of government business of each individual firm. In most cases, these corporate ethics programs were in place well before the implementation of recent government and industry-proposed initiatives in the ethics area. In a recent survey of government contractor accounting practices, for example, the public accounting firm of Price Waterhouse cited the following elements of self-governance programs implemented by contractors:

- an organizational structure which properly delegates authority and responsibilities;
- policies and procedures which address the specific tasks and functions relating to the pricing, costing and performing of government contracts;
- employee training in the unique requirements of government contracting; and
- ongoing programs to monitor compliance with corporate policies and procedures and government contracting rules.

Our members are highly motivated to conduct their business with integrity and ethics primarily because it makes good business sense to do so. Over the long term this is the most effective and successful way to market products and services to the government. The adverse media publicity and the ever-present threat of suspension and debarment in cases of alleged wrongdoing are also incentives to defense contractors to strive for high standards of ethical behavior by their employees.

We also want to recognize the important step taken by this Subcommittee in providing for the establishment of the Defense Advisory Panel on Government-Industry Relations (DAPGIR) in last year's DoD authorization bill. The group has been holding regular public meetings over the past several months and has begun to explore issues in ethics, debarment/suspension and other areas that affect the DoD-industry relationship. We would urge the Subcommittee and the Department to analyze the findings and recommendations expected to emerge from this panel before considering definitive steps to mandate specific ethics program requirements as a condition of doing business with the government.

COMMERCIAL PRODUCTS

The Packard Commission recommended the following with relation to commercial products:

> "Rather than relying on excessively rigid military specifications, DoD should make greater use of components, systems and services available, 'off the self.' It should develop newer custom made items only when it has been established that those readily available are clearly inadequate to meet military requirements."

Thereafter the 99th Congress enacted a law requiring "preference for non-developmental items," (i.e. commercial products) and the OFPP Act Amendments of 1988 created an advocate for the acquisition of commercial products, a position which remains unfilled. Despite these requirements, we have seen little improvement in the way DoD procures commercial products. EIA testified on May 16, 1989, before the Subcommittee on Oversight of Government Management of the Senate Governmental Affairs Committee, regarding the existing impediments to the acquisition of commercial products. The statements provided by EIA representatives from Boeing and Honeywell will be provided to you for the record of these hearings. The conclusion of our witnesses was that much can be done by DoD through regulatory reform within the current legislative framework, but little has been accomplished.

We also will provide for the record specific recommendations for regulatory changes to address problems with commercial exemptions to the submission of cost or pricing data and the flowdown of government terms and conditions to commercial subcontractors and suppliers.

ACQUISITION STREAMLINING

One principal focus of the Packard Commission's report was a series of recommendations designed to streamline the Defense Department's acquisition organizations and procedures. In essence these recommendations were for a new, more centralized, acquisition policy management with program management delegated to shorter, clearer, lines of command in each of the buying services.

As a result of this recommendation Congress has enacted a great many changes to the acquisition system. One of the most notable improvements is the concept of "Defense Enterprise Programs (DEP)," under section 905 of Public Law 99-661, the Defense Authorization Act for fiscal year 1987. These programs were to be structured in accordance with the Packard Commission's recommendations in the following manner:

- a "program executive officer" reporting directly, without intervening review or approval, to the senior procurement executive of the military department concerned;

- a program manager, similarly reporting directly to the program executive officer without intervening review or approval;

- exemptions from any regulation, policy, directive or administrative rule or guideline relating to acquisition activities of the Defense Department other than a basic Federal

Acquisition Regulation and the Department of Defense supplement to it.

The fundamental benefits of the Defense Enterprise Programs have existed for over 20 years in the fleet ballistic missile programs. An excellent current example of such a program is the Navy's Trident D-5 missile program. The exemplary organization and management of this program has, in the opinion of virtually everyone in the executive and legislative branches of government, led to substantial savings and efficiencies for the taxpayer. We suggest that the enviable track record of these defense enterprise programs sufficiently establishes their value. We further suggest that the time has come for Congress to extend the applicability of the defense enterprise program management system to every major program as suggested by the Packard Commission. Accordingly, EIA suggests that the language in Title 10 United States Code Section 2436 be amended to require the use of this management system on all such programs, and ensure more effective implementation of the DEP concept regarding streamlined management on programs so designated.

CONGRESS SHOULD ELIMINATE THE USE OF FIXED PRICE DEVELOPMENT CONTRACTS ON MAJOR PROCUREMENTS

Over the past 25 years DoD's use of extraordinary contracting methods has followed the track of the defense budget. In the late 1960s and early 1970s the "guns versus butter" debate at the end of the Vietnam War forced real cuts in defense spending. DoD responded by seeking to make the spending reductions without actually reducing the number or complexity of the systems it bought. It did so by seeking to shift costs and risk to contractors under a variety of new contracting methods, including the infamous "total package procurement" method.

Under that policy, the contractor was required to sign up to a fixed price contract covering both full scale engineering development ("FSED") and production at the time the FSED contract was awarded. The problem with this approach is that while prices can be guessed when FSED is commenced, neither technical nor financial risks can be measured with any degree of accuracy. In cases of fixed price FSED contracts, the contractor and DoD were left without the means of managing the technical and cost risks which are discovered during development.

As a result, virtually all of the systems which were bought under the "total package procurement method", including the LHA assault ship, the Los Angeles class attack submarine, the C5A transport, and many others suffered massive cost growth and overrun claims. DoD finally changed its rule governing major systems procurements (under DoD Directive 5000.1) to prohibit the use of total package procurement.

In late 1986, the DoD budget faced similar pressures. DoD promptly, and without public comment, removed the prohibition of total package procurement from DoD Directive 5000.1. As a result, DoD, led by the Navy and the Air Force, resorted to the failed policies of the 1960s. Fixed price development contracts became the order of the day. A new approach, called "cost sharing", even went so far as to require the contractor to pay a large portion of the costs of development outright.

Over the past two years, both Congress and the Defense Department have struggled with ways of dealing with the question of fixed price development contracts. In successive legislative measures, Congress sought to restrict the use of fixed price contracts for development purposes only to those approved by the Under Secretary of Defense (Acquisition).

Unfortunately, to our knowledge, each and every application for the USD(A)'s approval has been granted. The legal restrictions imposed by Congress have, in fact, been no restriction at all.

The Packard Commission best described the plight of contract managers dealing with fixed price development contracts when it said:

> "In underbidding, contractors assume that there will be an opportunity later in a program to negotiate performance trade-offs that make a low bid achievable, or to recover understated costs through engineering change orders. Today, however, most production and many development contracts are negotiated on a firm, fixed-price basis. For the government, the advantages of a fixed-price arrangement, particularly the incentives it creates for realistic bidding, are obvious. The disadvantage to the government, while more subtle, are nevertheless of real concern. The fixed-price contracts effectively can enshrine overstated requirements and understated costs in a legal arrangement that allows little or no flexibility for needed trade-offs between cost and performance. This contractual arrangement, intended to protect the government, may cause both sides to lose."
>
> (Packard Commission Report, June 1986, page 46).

We suggest that Congress finally resolve the issue by prohibiting the use of any type of fixed price contracts for the development of any system valued at over $10 million. Such a prohibition would serve to limit these significant technological and financial risks which create immeasurable difficulties for both government and industry.

AUDIT AND OVERSIGHT

The Packard Commission found that DoD organizations lack advance planning and coordination, are reluctant to share information and rely on each other's work, and their respective responsibilities are ill-defined. The Packard Commission further found that this resulted in extensive, inefficient and costly duplication in the oversight process. Because of these findings, the Commission recommended that the Under Secretary of Defense (Acquisition) oversee contract audit policy, establish policy for all DoD oversight of defense contractors, and recognize professional auditing standards. Further, the Packard Commission recommended that contract audit policy clearly define the responsibilities and jurisdictions of oversight organizations, provide guidelines to ensure that oversight organizations share contractor data, and rely on each other's work and improve audit strategies.

Section 901 of the Defense Acquisition Improvement Act of 1986 charged the USD(A) with most of these responsibilities (except for audit policy which was given to the DoD/I.G.). Shortly thereafter, a report was submitted by the Secretary of Defense on this subject, and many contractors were asked to support three studies on the subject of audit duplication, one by the Air Force, one by the OSD, and one by the DOD/I.G.

The FY89 DoD Authorization Act required that the USD(A) submit a report on simplification and streamlining of acquisition procedures. This report, submitted on December 20, 1988, addressed the actions taken and the actions in process to reduce duplicative and excessive oversight. The actions include requiring advance notice for on-site visits of government personnel, restoring contracting officer authority, establishing the Contractor Risk Assessment Guide (CRAG) as well as improving the coordination of contractor oversight activities such as pension and insurance reviews and compensation reviews. The report also notes that certain areas "with a high potential for duplication" are still under review. These areas include: "quality assurance systems reviews, contractor operations reviews performed by the Air Force, operational audits performed by DCAA, and security inspections performed by the Defense Investigative Service and Service organizations."

We are unaware of any instances of reduced audit oversight in practice. The fact that the FY '89 Authorization Act provided DCAA the authority to hire an additional 1,000 auditors argues the opposite. Contractors are besieged with DCAA auditors, military-service auditors and special-subject reviews, IG auditors, and GAO auditors. Many of these audits are duplicative in form, substance, and nature and are therefore intrusive and wasteful of the government's audit resources and industry's time. Many of the government's review teams are auditing the same information--they are just looking at it for a different purpose or because they don't trust their counterparts' findings. If we provide data on our overhead rates and bases to which they are applied in order to negotiate forward pricing rate agreements, we should not have to provide the same information to support a compensation system review, an Air Force COR, or any other audit. Congress should legislate reform of the audit process to provide that:

- All auditing and oversight functions should be arranged by the USD(A) as the central audit policy and operations manager. The USD(A) should prevent duplication of audits on any contractor facility or contract;
- Every audit and oversight agency should be required to accept the findings and conclusions of any other with the

exception of the DoD-IG when pursuing an allegation of criminal conduct; and

- All auditing and oversight functions be managed under an annually updated, centrally managed audit control function that is tasked with monitoring and preventing duplicative gathering of information by different audit functions and making maximum use of already-available audit data for multiple purposes.

DOD KEY TECHNOLOGIES REPORT

EIA has responded to your recent request for our views on the DoD key technologies in a formal submission dated May 5, 1989, which I will ask be included as a part of the record of these hearings. In summary, we agree that the technologies selected are generally appropriate, and the report should form the basis of even more effective and focused analyses as time goes on.

An important consideration in many of the technologies in question is the fact that they are being driven by the commercial sector and market rather than by the military. Thus, we would suggest that the commercial pull-through of each of the technologies be examined further with a view toward identifying the unique contributions, if any, that DoD involvement might foster.

We also want to emphasize the importance of specific focus on the opportunities to transition candidate technologies from design to production of actual systems and equipment. The design-to-production transition has long represented a major challenge in high-technology, low-volume defense production environments, and the capacity for actual real-world utilization of a given technology in a reasonable time frame should perhaps become an important selection criterion for future decisions to include technologies on this list.

Other specific comments tied to particular technologies referenced in the DoD report are included in our May 5 attachment to this statement.

HOSTILE TAKEOVERS AND THE ERODING DEFENSE TECHNOLOGY BASE

We are deeply concerned over evidence that the U.S. defense technology base is eroding. A recent CSIS study reported investment ratios in the defense technology and industrial base fell from 3.9 percent in 1982 to 3.6 percent in 1985 and that independent R&D by defense contractors declined in real dollars and as a percent of DoD related sales between 1984 and 1986. Further decay of our technology base may lie in the increasing vulnerability of defense firms to hostile takeovers, both foreign and domestic. While concerns have been expressed by the NAM and NSF there has been no systemic review and evaluation of the affect of such takeovers on our national technology base. The Exon-Florio amendment addressed the foreign takeover issue but not the issue of domestic hostile takeovers. The issue is complex given our free enterprise system but we believe this is a subject that warrants serious consideration by the Subcommittee.

In closing, Mr. Chairman, I want to thank you again for the opportunity of presenting these remarks on behalf of EIA, and would be pleased to respond to any questions.

ATTACHMENT TO STATEMENT BY FRANK J. LEWIS, JUNE 2, 1989.
SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY, SENATE ARMED SERVICES CMTE.

Electronic Industries Association

Peter F. McCloskey
President

May 5, 1989

Senator Jeff Bingaman
Chairman
Subcommittee on Defense Industry
and Technology
Senate Armed Services Committee
Washington, DC 20510-6050

Dear Senator Bingaman:

On behalf of the Electronic Industries Association, I am very pleased to provide this response to your invitation to submit our views on the Defense Department's Critical Technologies Plan.

We recognize and appreciate the difficulties faced by the authors in formulating this initial report to Congress. To select twenty key technologies from the hi-tech-dominated defense and energy fields is not an easy task and is certain to be somewhat subjective. However, this report does serve to establish an important reference point from which future reports can be more directly focused to meet the Congressional intent.

Our comments are based on a review of the unclassified report. It may well be that some of our concerns were addressed in the classified version of the report.

The following attached and specific comments from our Association should be regarded as constructive suggestions for both DoD and Congressional participants. We trust you will find them responsive to your request.

Sincerely,

Peter F. McCloskey
President

Attachment
/aa

GENERAL COMMENTS

- While we have noted a few differences, we agree, in general, with the technologies selected.

The value of the information on resources would have been greatly increased by providing additional details on how these funds are being utilized. For each technology area, it would be useful to know if the funding is for basic or applied research or other details on the direction of the effort and towards what applications.

- Many of the technology descriptions are too broad. To be really useful in a technology plan, there should be more specificity -- perhaps by dividing into subsets.

- In many technologies, the commercial area, rather than DoD, is driving technology. This should be recognized by giving greater attention to the commercial pull-through of each of the technologies with emphasis on the needed unique high leverage DoD contributions. Government funding in areas which are commercially dominated, such as microelectronics, should be clarified.

- Greater use should be made of prior technology studies and reports of such groups as the Defense Science Board (DSB) and the services science boards, the National Academy of Engineering, Air Force Forecast II, and others. This would provide a greater breadth of inputs to make such a comprehensive report better meet congressional needs. Particularly pertinent would be the 1981 DSB Summer Study on the Technical Base.

- Missing areas of technology which should be carefully considered for future studies include those more focused in undersea warfare such as sonar.

- The stature of the report would be enhanced if were transmitted to Congress or otherwise attributed to, or endorsed, by the Secretary of Defense, DDR&E or other senior defense official. There was no apparent indication of authorship.

- Greater attention in the selection of key technologies should be given to their transition into production or utilization in systems. At least equal to the importance of developing new technologies per se is the system leverage which they provide. This quite possibly should be the fundamental selection criteria for the list of technologies.

SPECIFIC TECHNOLOGY COMMENTS

1. Microelectronic Circuits and Their Fabrication

There is no debate about the criticality of this. The issues are whether commercial or military requirements drive the technology, and why isn't DoD-funded semiconductor technology more effectively inserted into weapons systems? Missing is any discussion on the alarming increase in the cost of manufacturing equipment, multi-material (Si and GaAs) chips and advanced packaging to pick up the slack at the system level as the rate of scaling of previous decades slows.

The cost of capital could be the most critical driver in technological progress in this area.

The microelectronic technologies should be separated from the MMIC technologies as the critical nature of the technologies, the funding streams, milestones, and competitive assessments are distinctly different.

More emphasis should be placed on the importance of computer-aided design tools for the design of complex high performance military microelectronics. Such tools are vital to quick turnaround, accurate design implementations and are still centered in the U.S.

Substantial progress is being made in radiation-hardening microelectronics and this is an area of uniquely military interest. Also, emphasis needs to be given to device packaging and interconnect, which are important bottleneck areas in building reliable, high performance systems. This is an area where substantial progress is being made today in this country and in Japan.

2. Preparation of Gallium Arsenide and Other Compound Semiconductors

The importance of Gallium Arsenide materials is recognized but this section should have devoted more coverage of the other compound semiconductors such as HgCdTe. It should also include the very promising work under way to deposit well-controlled heteroepitaxial layers of GaAs on silicon substrates, gaining the advantages of large wafer-size without the extended development required to grow larger diameter GaAs crystals.

3. Software Producibility

The commercial sector is moving toward software paradigms that support reusability, understandability, and modifiability. Object-oriented paradigms offer these features, and early indications are that substantial gains in software cost, development time and quality are available. The DoD focus on ADA, while certainly a step in the right direction, may preclude the really significant gains that object-oriented paradigms are beginning to demonstrate in the commercial world.

4. Parallel Computer Architectures

This is a well-written section. We agree with the major areas of challenge and suggest they could be used as the basis for subdividing the technology for the purpose of presenting meaningful milestones and competitive assessments. More emphasis should be given to algorithms and support tools. The knowledge and experience to effectively use the current class of advanced architectures is lacking. Software development is extremely difficult and the analysis and maintenance of large parallel software systems is impossible with today's software tools. New fundamental algorithmic approaches to problems will be required. Suggested milestones appear overly aggressive for commitment to system applications. The discussion of the Soviet competitive position was good and bears out the point that they will make use of commercial hardware, but the software will be the major competitive discriminator.

5. Machine Intelligence & Robotics

This section is very qualitative -- long on potential and short on operational impact. The justification should be based on force multiplier. There is little mention of the importance of AI in operations management, C3I, etc.

We believe that the information management aspects will be of far greater importance to DoD than robotics per se, which has a more limited role.

The requirements for smart weapons, decision aids, and improved diagnostics are all responsive to the need for reduced manpower and improved weapons functionality. The document should discuss the requirements for enhanced strategic intelligence exploitation, in response to disarmament activity. Although the planned effort is somewhat underfunded, the DoD program is well-organized. Only selected robotics milestones are covered.

6. Simulation and Modeling

While of considerable importance, we question whether this warrants being in the top 22 technology areas.

Simulation and Modeling is an essential part of every modern system design and training program. The major underlining technologies should be identified with milestones and competitive assessments. This would include techniques for realistic physical modeling, database technology, real-time interactive displays, image generators, very high speed processing, and AI (MMI, cooperative expert systems, reasoning with uncertainty, etc.) The resource level indicated appears to be significantly understated in considering the full range of the technology.

In future reports, we suggest this be included in the more encompassing area of Design Methodology, which could also include Concurrent Engineering and Design for Manufacturing.

7. Integrated Optics (Photonics)

We believe this may be an overly optimistic appraisal of both the potential contribution of this technology area, particularly optical computing, and its time frame for achievement of practical application.

The Sensor Applications area required intermediate milestones for 1990 and 1995 or the 2,000 goals won't be reached -- suggest staged approach to 1GOPs and 10^{12} BPS. High accuracy, high density, lightweight phased array antenna is a major activity which could consume all of the resources identified. Suggest it should be included in the Phased Arrays technology.

$25M a year will support research but not prototype equipment builds. The international comparisons seem to be accurate.

There is no mention of the ETI program in Optical Processing, which has very realistic goals for system demonstrations in the next three years (and $50M funding). The major issue is partitioning the system between optical and electrical domains. An all-optical digital computer should not be a goal.

8. Fibre Optics

We question that this warrants inclusion as a separate technology in the top 22, although FOG-M is important. Undersea surveillance and undersea cabling require short-term (1990) milestones; e.g., staged approaches to the 1995 demonstrations. Resources are adequate for research. Was the Tri-service Fibre

Optics Committee consulted in preparing this section?

9. Sensitive Radars

The radar environments are constantly proliferating and changing. The report did not seem to address the impact of these changing environments. The emphasis is on countering LO defensive actions and on multispectral operation. There is no mention of jammers or the threat from precision emitter location systems. The 76% contribution of SDIO funds may be disproportionate to mission requirements.

Radar and ESM are each major areas and should probably be treated separately. The given milestones refer to radar. ESM milestones need to be defined. If laser radars will require $130M, then $40M remains for the other areas. This will support research but would not permit demonstrations involving significant equipment builds. International comparison is probably inadequate in light of the large amount of work in radar and related sensors.

10. Passive Sensors

This section is too narrow as written. It makes no mention of IR Focal Plane Array producibility, testability, and IR countermeasures issues. Testability could be a limiting cost driver. There should be a EO/IR Sensor milestone earlier than 1995, dealing with MCT. A standard process technology for second generation material should be identified. This is needed to support the 1995 producibility demo milestone. Basic materials research is also needed. Resources are adequate. International comparison is adequate.

11. Automatic Target Recognition

The description doesn't stress the inability of current approaches to deal with the quantity of imagery or the extremely high resolution of future imagery. Broad area search is largely missing from the discussion. Current state-of-the-art is a bit optimistic. 1995 milestones could easily slip by three to five years and 2000 milestones by ten years.

Correlation techniques are essentially 2D and are easily confused by changes in appearance of target. Appearance depends on type of sensor (visible, IR, lidar/radar), but each modality exhibits possibilities of confusion: camouflage/decoy, illumination angle, specularities, shadows, etc. This was the main reason for starting research in 3D model-based approaches.

Neural nets are potentially useful in ATR and should be explored.

ATR will have to get beyond today's fragile capabilities. Perhaps revolutionary rather than evolutionary ATR developments are required.

The strategy for testing and implementing ATR on weapons should be addressed.

12. Phased Arrays

The report makes a good case for this and is well-written. The concept of smart skins may be ahead of its time. Conformal phased arrays are important in airborne applications but are not significant in ship and land-based applications. Digital beamforming and distributed apertures require more emphasis, particularly affordability.

The Conformal RF Phased Arrays milestone for 1990 seems optimistic if it refers to a capable, multimode, airborne, conformal radar. Accoustic Phased Array milestones require more information. Funding appears to be adequate for research but will not support demonstrations. International comparison should include a comment on how Japanese GaAs capability and manufacturing skills could impact the affordability of phased arrays.

13. Data Fusion

The description is accurate and complete for the most part. The most pressing need is for technology to digest an ever-growing flood of data and present a succinct summary of the most important information to the human user. This higher level data fusion usually requires the fusion of sensor data with collateral information such as might arise from text messages or from knowledge of enemy capabilities and doctrine. AI techniques will be needed to provide this higher level fusion.

Data Fusion must deal with multiple data representations. Object-oriented techniques, including object-oriented databases with persistent object storage are likely to be of great importance in this regard. ATR suffers from this same kind of data fusion problem.

14. Signature Control

This is nebulous, probably due to classification.

15. Computational Fluid Dynamics

We believe this should be included in what was originally termed Simulation and Modeling (#6), which we recommended be broadened out to Design Methodology.

Use of computation as a means of simulating fluid dynamics reflects the tremendous increase in compute power of supercomputers. Funding for this technology is modest and schedules are not particularly aggressive, which may warrant further emphasis. Assessment of Soviet as well as allies' capability is sound and depends primarily on availability of supercomputing. An adequate provision for commercial contribution and benefit from this technology is available within the framework of DoD/NASA-supported IR&D.

16. Air Breathing Propulsion

This section is exceptionally well-written. The program appears to be well-coordinated among the Services.

The stated goals provide for dramatic improvements in aircraft propulsion on reasonable schedules into the next century. The assessment of Soviet capability is sound and cooperation driven by commercial interests with allies accurately reflects the situation.

17. High Power Microwaves

This appears to be too narrow. It could be broadened to include Pulsed Power and Directed Energy Weapons. The High Power Microwave 1990 milestones appear to be too ambitious. Additional work is needed in understanding coupling and damage mechanisms. Suggest using existing powerful phased arrays for early experiments. Resources appear sufficient for research but inadequate for building up high power demos. International comparison is inadequate in light of potential impact.

18. Pulsed Power (See above)

19. Hypervelocity Projectiles

Attention should be given to the physics of penetration and damage mechanisms. There should be a more balanced program between chemical energy penetrators and HVM.

20. High Temperature/High Strength/Lightweight Composite Materials

This appears worthy but otherwise we have no comment.

21. Superconductivity

We question whether the inclusion of superconductivity in the top 22 meets the Congressional request for "technologies most essential to ensuring the long-term qualitative superiority of U.S.

weapons systems;" however, it is recognized as an important general technological area.

22. Biotechnology Materials and Processing

This is clearly of interest for national health, but this is not a critical military technology. There is no clear military significance here. The application is to maintenance functions, not operational capability.

Senator **Bingaman**. Thank you very much.

Mr. Menaker, why don't you go right ahead.

STATEMENT OF FRANK H. MENAKER, JR., VICE PRESIDENT AND GENERAL COUNSEL, MARTIN MARIETTA CORP. AND CHAIRMAN, DEFENSE INDUSTRY INITIATIVE

Mr. **Menaker**. Yes, sir. Thank you.

If I may, I would also like to submit my statement for the record. I have several attachments to the statement that I would also like to put in the record, including a copy of the Defense Industry Initiatives, Mr. Chairman, and a copy of our most recent annual report on the DII. I would also like to add a copy of The Best Practices Forum discussion program that took place in Chicago last week to the record as well.

Then, with that, I would just summarize what it is I would like to say.

Senator **Bingaman**. That will be fine.

[The material referred to follows:]

DEFENSE INDUSTRY INITIATIVE ON BUSINESS ETHICS AND CONDUCT

1988 ANNUAL REPORT TO THE PUBLIC AND THE DEFENSE INDUSTRY

PREPARED BY
ETHICS RESOURCE CENTER, INC.
WASHINGTON, DC

JANUARY 1989

"Ethical accountability, as a good-faith process, should not be affirmed behind closed doors. The defense industry is confronted with a problem of public perception — a loss of confidence in its integrity — that must be addressed publicly if the results are to be both real and credible, to the government and public alike. It is in this spirit of public accountability that this initiative has been adopted and these principles have been established."

Defense Industry Initiatives
on Business Ethics and Conduct
June 1986

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I. BACKGROUND OF THE DEFENSE INDUSTRY INITIATIVES

During the 1980s, public concern about malfeasance in the defense industry grew as investigations of major defense contractors increased and reports of procurement irregularities proliferated. In July of 1985, President Reagan asked David Packard, the Chairman of Hewlett-Packard and a former Deputy Secretary of Defense, to chair a specially appointed, independent Blue Ribbon Commission on Defense Management, which came to be known as the Packard Commission. The commission was directed to conduct a broad study of defense management, including the budget process, procurement, organization and operation, and legislative oversight, and to make recommendations for streamlining and improving defense management. In its Interim Report, dated February 28, 1986, the Packard Commission recognized the limits of federal regulation and suggested that effective self-governance might help to curb industry misconduct. The Interim Report stated:

> To assure that their houses are in order, defense contractors must promulgate and vigilantly enforce codes of ethics that address the unique problems and procedures incident to defense procurement. They must also develop and implement internal controls to monitor these codes of ethics and sensitive aspects of contract compliance.

A number of companies in the defense industry responded to the Commission's preliminary recommendations with concrete action of their own. In the late spring of 1986, representatives of 18 defense contractors met and drafted six principles that became known as the Defense Industry Initiatives on Business Ethics and Conduct, or "DII" (for the text of the Initiatives, see Exhibit 1). These principles, which appeared in the Appendix to the Packard Commission's June 1986 final report to the President, "A Quest for Excellence," pledged the signatory companies to promote ethical business conduct through the implementation of policies, procedures and programs in the following six areas:

- Codes of ethics;
- Ethics training;
- Internal reporting of alleged misconduct;
- Self-governance through the implementation of systems to monitor compliance with federal procurement laws and the adoption of procedures for voluntary disclosure of violations to the appropriate authorities;
- Responsibility to the industry; and
- Accountability to the public.

The Initiatives were intended to promote sound management practices, to ensure that companies were in compliance with complex regulations, and to restore public confidence in the defense industry. At the time the Packard Commission's final report appeared in June 1986, there were 24 signatory companies to the Defense Industry Initiatives. That number has grown as of this writing to 46 (see Appendix A). The total number of signatories has remained constant over the course of the past year. Several additional companies have adopted the Initiatives, but two signatories have withdrawn and three have been acquired by other companies. Although the number of signatory companies is small compared to the total number of firms doing business with the Department of Defense, the 46 signatories include all of the top ten and 21 of the top 25 defense contractors in fiscal 1987 in terms of prime contract awards. Together, they represent over one-half of the fiscal 1987 DoD contract awards.

The signatory companies established a Steering Committee of corporate executives to be the policy-setting body for the DII and a Working Group to analyze policy issues and present recommendations to the Steering Committee. Both the Steering Committee and the Working Group are composed of representatives of the same seven signatory companies (for a list of members, see Exhibit 2).

In addition, the position of DII Coordinator was created to handle administrative details, arrange meetings, and conduct the day-to-day business associated with the DII. The position was originally to have had a term of three months, but it has since become an open-ended appointment. The first DII Coordinator was Rhett Dawson, who had been the Executive Director of the Packard Commission. He acted as DII Coordinator from July - December 1986. Upon Dawson's return to government service, the Steering Committee appointed Alan Yuspeh, the former General Counsel of the Senate Armed Services Committee and currently an attorney with the law firm of Miller and Chevalier, as the new DII Coordinator. He has served in that capacity from the beginning of 1987 to the present.

In order to promote industrywide cooperation, to share experience, and to discuss matters of business conduct and compliance with laws and regulations, the signatories of the Initiatives agreed to convene periodic Best Practices Forums, the first of which was held October 30-31, 1986, in Washington, DC. The Forum was attended by several hundred individuals from 50 signatory and non-signatory companies. Participants discussed codes of ethics, ethics training programs, and compliance monitoring efforts that were being undertaken by signatory firms. These issues correspond to Principles 1,2,3 and 4 of the DII. The second Best Practices Forum was held June 29-30, 1987, in Chicago and was devoted to the issue of public accountability, addressed in Principle 6 of the DII. This meeting was attended by representatives of the signatory companies and their outside accounting or law firms, and a number of non-signatory companies. The third Best Practices Forum was held June 7-8, 1988, in Dallas. Panels addressed approaches to organizing and implementing self-governance programs and discussed ways of evaluating these programs. In addition, senior government representatives from the DoD Inspector General's Office, the Defense Procurement Fraud Unit of the Department of Justice, the Defense Contract Audit Agency (DCAA) and Air Force Systems Command shared their perceptions of the DII. A closed session attended only by representatives of the signatory companies examined the first annual public-accountability report and discussed possible improvements in the reporting process, which is described below.

As part of Principle 6 of the Defense Industry Initiatives, the signatory companies have committed themselves to public accountability. The mechanism for public accountability requires that each company submit to an examination or review of its ethics policies, procedures and programs annually for the next three years to demonstrate the company's compliance with the DII principles. Each company is required to complete an 18-point questionnaire (see Exhibit 1) and submit it to an independent public accounting firm or a similar independent organization, which is to conduct an examination or review of the company's responses to the questions and attest to their accuracy. Principle 6 directs the examiners and reviewers to submit their opinion letters, along with the companies' responses, to an external independent body, which is to prepare a public report that summarizes the responses of the signatory companies as a group.

This report, the "1988 Annual Report to the Public and the Defense Industry," is the second report prepared in accordance with the public-accountability requirement of the DII. The companies participating in the process hope that the three years of examinations and reviews will give added force to the initiatives and demonstrate that the defense industry is serious about its commitment to act in accordance with the highest standards of business conduct.

II. INTRODUCTION

The number of signatory companies participating in the public-accountability process increased from 34 in 1987 to 42 this year (see Exhibit 3). Four other current signatory companies endorsed the Initiatives too late to participate in this year's process.

The responding companies range in size from about 4,000 employees to more than 400,000 employees, with revenues from about $325 million to more than $50 billion. Defense contracts account for less than 10% of revenues in some signatory companies, while others rely almost completely on DoD business. Most of the signatories develop and manufacture products specifically for DoD use; a few of the signatory companies primarily sell commercial, off-the-shelf products to government customers, and several signatories are principally suppliers of services. In some of the companies, defense-related business is organizationally separate from commercial operations. In other companies, the same operating units may perform both defense and commercial work.

In the first year of the public-accountability process, the Steering Committee decided that the examinations or reviews should cover programs in place during the period of July 1 through September 30, 1987, in order to give companies adequate time from the signing of the Initiatives to implement their commitments under the DII, and to allow completion of the examination/review process by the end of 1987. In 1988, the reporting period was the year ending September 30, or a period of at least ninety days prior to that date in the case of new signatories. Thirty-four of the participating companies reported for the year from October 1, 1987 through September 30, 1988. Five relatively recent signatories, none of which had participated in the first year's examination/review process, reported for the period from July 1 through September 30, 1988; another new signatory reported for the period from June 1 through September 16, 1988. The remaining two companies modified their reporting periods, one to cover the period from October 24, 1987 to September 30, 1988, the other to cover the period from November 30, 1987 to October 1, 1988.

Each of the 42 participating signatory companies completed a questionnaire concerning certain policies, procedures and programs which were to have been in place during the reporting period. The original language of Principle 6 of the DII had indicated that each company's independent public accountants or similar independent organization should complete the questionnaire; however, an Auditing Standards Board Task Force determined that the questionnaire process should constitute an attestation engagement. In order for the independent public accountants to conduct an attestation engagement, the companies themselves were required to complete the questionnaires and submit their responses to the accountants for an examination or review.

Accordingly, each of the participating companies completed the questionnaire and submitted its responses to its independent public accountants or a similar independent organization. In 41 cases, companies submitted their questionnaires to accounting firms; in one instance, the company chose a law firm.

The Auditing Standards Division of the American Institute of Certified Public Accountants and representatives of the DII signatory companies agreed to a framework for the examinations and reviews. That framework is embodied in the "Interpretation of Statement on Standards for

Attestation Engagement, Attestation Standards: 'Defense Industry Questionnaire on Business Ethics and Conduct,'" henceforth referred to as "Interpretation" (see Exhibit 4).

The "Interpretation" obliged each company to submit with its questionnaire responses an assertion letter stating that the company's responses were based on policies and programs in operation during the reporting period, and that the responses were appropriately presented in conformity with the criteria set forth in the DII. One company did not submit an assertion letter in 1988; another company submitted an assertion letter to its independent body, which did not forward the letter to the external independent body.

Consistent with the "Interpretation," signatory companies had the option of asking their independent body to perform either an examination or a review of their questionnaire responses. This year, 40 companies had their independent body perform an examination, while only two companies requested a review. The "Interpretation" specifies that "a review is substantially less in scope than an examination, the objective of which is the expression of an opinion on the affirmative responses in the Questionnaire." Examiners were required to attest that a company's responses were appropriately presented in conformity with the criteria set forth in the DII, including the questionnaire. Reviewers, on the other hand, were required only to attest that nothing had come to their attention during their review that caused them to believe that the company's responses to the questionnaire were not appropriately presented.

Examiners were required to obtain more evidence by talking to a broader sampling of the company's employees or examining more documentation. For example, Question 15 on the DII questionnaire asks, "Is there a program to monitor on a continuing basis adherence to the code of conduct and compliance with federal procurement laws?" The procedures for both examinations and reviews instruct the independent bodies to "determine by inquiry of company officials and/or by reading relevant documentation how the company monitors, on a continuing basis, adherence to the code and compliance with federal procurement laws." The procedures for examinations, however, further instruct examiners to "obtain additional evidential matter, for example by reading internal audit reports, of the company's monitoring of compliance with the code and federal procurement laws." Thus, a review would determine *how* monitoring is done, while an examination would also ascertain *that it is done*. (For a question-by-question comparison of the procedures for examinations and reviews, see Appendices A and E to the "Interpretation": Exhibit 4.)

The independent bodies conducted their examinations and reviews by visiting plant sites; by interviewing key managers; by looking over codes of ethics, corporate policies and procedures, attendance sheets for ethics training workshops, company newsletters, logs of hotline calls, minutes of meetings of the Board of Directors, and other documentation; and, in the case of examinations, by talking to random samples of employees. In many cases, internal audit staff assisted in this process.

Consistent with the "Interpretation," each examiner or reviewer was obliged to issue an opinion on the appropriateness of the company's answers for the reporting period. Appendix B to the "Interpretation" gives illustrations of five types of possible opinions for examinations, while Appendix F gives a single example of an opinion for a review (see Exhibit 4). Thirty-nine independent bodies gave an unqualified opinion; three others gave an unqualified opinion/report modified for negative responses. Among the 39 unqualified opinions, there was one company that had a "no" response but whose examiner did not modify its report for negative responses.

The opinions do not entail an assessment of the quality or effectiveness of a company's policies, procedures and programs, nor do they express any judgment on the part of the examiner or reviewer as to whether a company was fully in compliance with federal acquisition laws and regulations. However, as Question 18 makes clear, each company's public accountants or a similar independent organization is required to comment to the Board of Directors or a committee thereof on the *efficacy* of the company's internal procedures for implementing the company's code of conduct.

The examiners and reviewers were instructed to send their attestation letters along with the companies' DII questionnaire responses to the external independent body, whose role is to collect all the responses, analyze them, and issue a report simultaneously to the participating companies and to the general public summarizing the collective responses of the companies and describing generally what signatory companies are doing to comply with the Initiatives (see Exhibit 5, "Role of the External Independent Body"). The external independent body may contact examiners and reviewers to ascertain the methods used to conduct the examinations or reviews and to seek clarification of responses. The Ethics Resource Center, an independent, non-profit, educational organization, was chosen as the external independent body because of the Center's familiarity with the defense industry and its understanding of self-governance (see Exhibit 6, "The Ethics Resource Center"). The Center itself was not asked to conduct any examinations or reviews, nor was it requested to evaluate the efficacy of any of the signatories' programs.

The companies submitting DII questionnaire responses were invited to submit, through their examiners or reviewers, relevant documentation and illustrative company materials to the external independent body. Eighteen of the responding companies did so. The materials included codes of ethics, policies, procedures, descriptions of training programs, and copies of articles on business conduct that appeared in internal company publications.

III. SUMMARY OF RESULTS

Several points should be noted with regard to the summary of results which follows. First, each of the companies is organized differently. They may give different titles to individuals or groups that perform essentially the same function in different companies. Similarly, individuals or groups with the same title may have slightly different functions, follow different procedures, or have different reporting relationships. For purposes of analyzing and reporting in aggregate the responses of the 42 participating companies, the Center has chosen to ignore minor distinctions in titles, functions, and procedures. For instance, one company's "Corporate Office of Business Practices," another's "Ethics Program Office," and yet another's "Corporate Committee on Defense Industry Ethics" have all been categorized as "Ethics Offices/Committees."

Second, some of the signatory companies are highly decentralized and do not have a unitary ethics program for all of their operations. The programs may differ significantly among different divisions. Where appropriate, the Center has noted where these differences exist.

Third, because 40 of the 42 companies chose to have their independent bodies conduct an examination rather than a review, the Center has aggregated the company responses to the 18 questions without distinction as to whether those responses were examined or whether they were reviewed by the companies' independent bodies.

Fourth, respondents were invited, but not required, to elaborate on their "yes" or "no" answers and to provide the external independent body with relevant details about their policies, procedures and programs. The Center's analysis is based on the questionnaire responses, such other information as was provided by the respondents through their examiners or reviewers, and the Center's discussions with examiners and reviewers.

Fifth, although the 18 questions were essentially derived from the six DII principles, the correspondence between principles and questions is not exact. The following table shows the correlation between the principles and the questions drawn from them:

Principle	Question(s)
1	1, 4, 6, 14
2	2, 3, 5, 11, 12
3	7, 8, 9, 10
4	13, 15
5	16, 17
6	18

In some cases, the questions ask for more than the principles require. For example, Question 14, which asks if implementation of the code's provisions is a standard for evaluation of supervisory performance, usefully goes beyond the requirement of Principle 1 for a "clear assignment of responsibility to operating management and others for monitoring and enforcing the standards throughout the company." The question advances the principle a logical step forward by providing a mechanism for assessing how well supervisors are fulfilling their obligations under the DII. Similarly, Question 18 goes beyond the requirement of Principle 6 that an independent organization conduct an annual examination or review to also require that the independent organization "comment to the Board of Directors . . . on the efficacy of the company's internal procedures for implementing the company's code of conduct."

In other cases, the questions require less than the principles seem to intend. Whereas Principle 2 seems to indicate that training programs should cover all employees ("each company will train its employees concerning their personal responsibilities under the code," "adherence to the code becomes a responsibility of each employee," "codes of business ethics and conduct are effective only if they are fully understood by every employee"), the language of Questions 3 and 5 permits a broader reading. A company could (and some respondents did) give an affirmative answer to these questions, when orientation and training about the code were in fact provided only to some employees in the organization. The inadequacies of Questions 3 and 5 vis-a-vis Principle 2 were noted in last year's public-accountability report and were called to the attention of the DII Working Group at that time.

Principle 5 states, "Each company's compliance with the principles will be reviewed by a Board of Directors committee comprised of outside directors." The corresponding question, number 17, makes no mention of outside directors, and the examinations and reviews do not specify whether reports were made to committees comprised of outside directors. This point was also noted in last year's public-accountability report and was called to the attention of the Working Group at that time.

The following is a question-by-question breakdown of the company responses to the questionnaire and an analysis of those responses (Chart 1 shows the percentage of companies that responded "yes" to each question):

QUESTION 1

Does the company have a written code of business ethics and conduct?

Yes: 42 No: 0

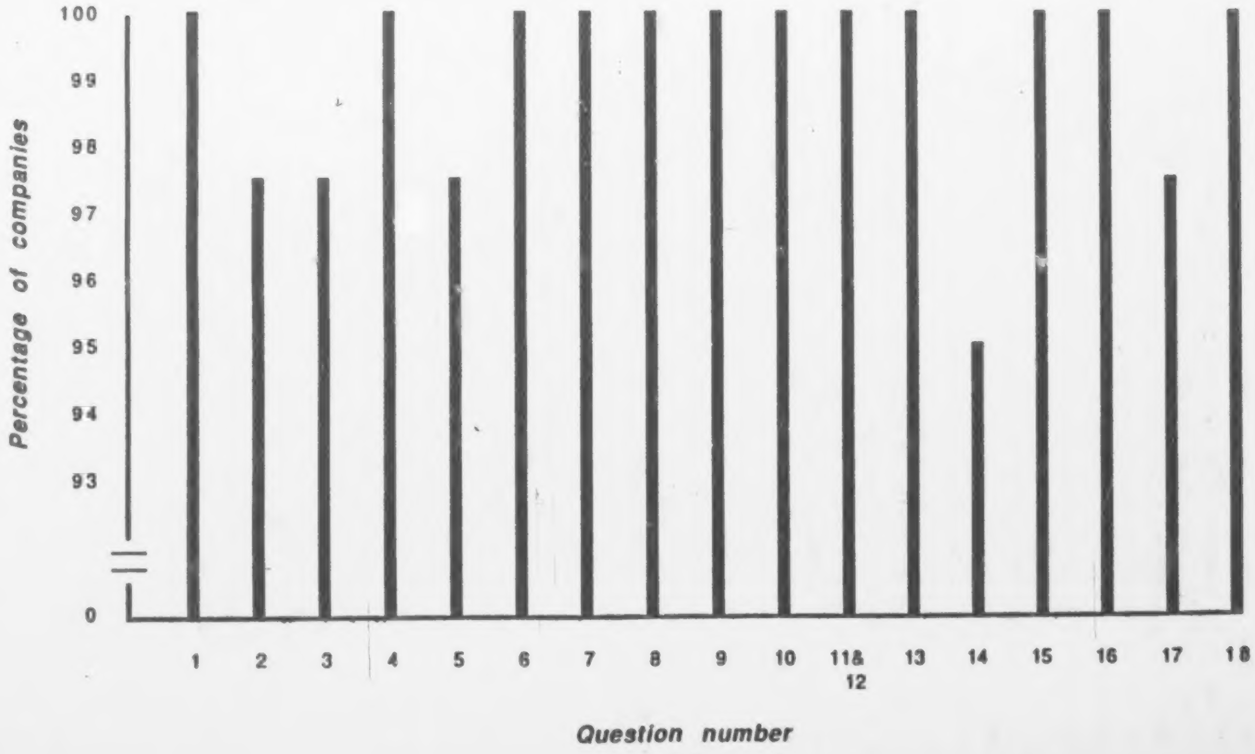
A code of ethics articulates the values, principles and standards intended to govern employee conduct. All of the participating companies have codes of ethics. For 20 of the respondents, a single document constitutes the company's code. The document is typically entitled "Code of Ethics," "Standards of Business Conduct," "Business Conduct Guidelines," or something similar.

In an additional 17 companies, the code is comprised of two or more documents. Some of these companies have a general code of ethics that applies to all their employees, plus additional standards for their employees principally involved in defense work. Others have a general ethics policy document, plus specific rules and guidelines for particular functional areas. For example, one company has a code of conduct and an additional document that addresses ethics in purchasing. Still other companies have an ethics policy document and additional materials that explain the company's policies in greater detail or provide examples in question-and-answer form to illustrate the

CHART NUMBER ONE

DEFENSE INDUSTRY INITIATIVES
REPORT OF EXTERNAL INDEPENDENT BODY

PERCENTAGE OF "YES" RESPONSES TO EACH QUESTION



application of policies in concrete situations. In a few instances, individual divisions have their own codes in addition to the corporate code.

Four companies specified that their code of conduct consists of one or more documents supplemented by corporate policies and procedures. The final company justified a "yes" answer based on the fact that it has various corporate policies that address ethics as well as other matters. The company collectively considers these policies a code, even though the policies have not been gathered into a single document.

Three of the reporting companies developed new code documents during the year ending September 30, 1988. An additional nine companies revised their codes during this period, and one company stated that it plans to revise its code during the coming year.

QUESTION 2

Is the code distributed to all employees principally involved in defense work?

Yes: 41 *No: 1*

Of the 41 companies that answered "yes," three specified that they distribute their codes to all employees worldwide. Twenty stated that they distribute their codes to all employees, and 18 specified that they distribute them to all employees principally involved in defense work. Twenty-seven companies added, either under Question 2 or in their answers to other questions, that they require employees to execute written acknowledgments that the employees have received the code, have read and understood it, or agree to abide by its provisions. Two of these companies require such acknowledgments only in some operating units or only from management personnel. Managers and supervisors in three companies are required to certify that they have distributed the code to their subordinates.

Five companies redistributed code documents during the reporting period. One of these companies has a policy of redistributing its code to all employees on an annual basis.

One company makes its code of ethics available in braille for sight-impaired employees.

The respondent that answered "no" is a decentralized company that has left the manner of code distribution up to the individual operating units. At the most recent distribution, one largely commercial unit did not distribute the code to hourly and some non-management salaried personnel; another unit distributed only one of the two code booklets to non-management salaried personnel. All new employees in all operating units receive the code, and the policies which comprise the code are available to all employees throughout the company.

QUESTION 3

Are new employees provided any orientation to the code?

Yes: 41 *No: 1*

All but one of the respondents have some sort of orientation to the code for new employees.

Ten companies sign new employees up for the next available ethics training session (see the commentary on Question 5, below). Training is generally provided within 30-90 days of hire, although a longer period may elapse in the case of employees at small, isolated facilities. These companies usually distribute their codes of ethics to new employees upon hire, although new employees in two companies do not receive copies of the code until they attend a training session.

Another respondent is a small company that has a policy of providing new employees with an orientation to its code, but there were no new employees during its three-month reporting period.

One company stated that new employees simply receive the company's code and sign an acknowledgment. That company indicated that an orientation video addressing ethics, fraud, waste and abuse was under development and due to be ready for use by the end of 1988.

It is worth noting that although one company, responding "yes," reported that its orientation consists of distribution of its code and a signed acknowledgment, another company gave a "no" response to Question 3 because the company did not consider mere distribution of its code and the execution of an acknowledgment card to constitute an orientation.

The remaining 29 companies that answered "yes" distribute the code to new employees (in many cases requiring employees to sign acknowledgment cards) and provide some sort of formal orientation to it. In one decentralized company, most operating units provide new employees with an orientation to the code, while other units merely distribute the code and other ethics materials or arrange to have new employees attend the next available training session.

The companies that provide a formal orientation to their codes use a variety of methods and procedures, which may differ by operating unit or employee level, even within the same company. The following list shows how many companies use a given form of orientation. The number in parentheses indicates how many companies use these methods *only* in particular operating units or among certain levels of employees.

• Opportunity for question-and-answer	28 (1)
• Orientation regarding reporting mechanisms (see commentary to Question 7, below)	25 (1)
• Videos	18 (4)
• Lectures/explanations/briefings/discussions	17 (2)
• Distribution of other ethics materials	6 (3)
• Function-specific training	4 (4)
• Slide presentation	1
• Assignment of an ethics counselor to each new employee	1 (1)
• Microcomputer-based tutorial program	1 (1)

Orientation sessions are generally conducted by supervisors, ethics officers, or personnel from human resources, training or law departments.

As noted above, a division in one signatory company includes assignment of an ethics counselor as part of new-employee orientation. The ethics-counselor program provides immediate and ongoing communication and training to employees with regard to ethics and compliance. Counseling groups meet at least quarterly to identify ethics issues and potential problem areas, to encourage compliance, and to allow experts to address employees' questions. The program has been extended to encompass some 38,000 employees, virtually every employee in the division. It has recently been introduced at another division of the same company.

Also worth noting is one company's microcomputer-based tutorial program. This program is a computer game that presents various ethics scenarios and allows an employee to choose between different courses of action. It is used principally with employees at remote locations.

Of the 41 companies that answered "yes" to Question 3, two noted that they had revised or expanded their orientation programs during the reporting period. Two others planned to implement expanded programs by the end of 1988.

The respondent that answered in the negative also gave a "no" answer last year. In its response last year, the company stated that newly hired salaried employees receive the company's code and sign an acknowledgment; the company stated that it intended to extend this practice to new hourly employees as well. This year, the company confirmed that it currently distributes its code to all new employees and requires them to sign an acknowledgment. The company further stated that it plans to implement a formal orientation program during 1989.

QUESTION 4

Does the code assign responsibility to operating management and others for compliance with the code?

Yes: 42 No: 0

All of the respondents' codes mention the responsibility of management and others to ensure compliance. The codes of four companies state the responsibility of managers themselves to comply with the code, while the codes of 24 other companies stress the need not only for managers themselves to comply, but for them to ensure the compliance of employees who report to them. Fifteen codes assign managers responsibility for providing their employees education and communication about company policy. A few codes require managers to understand the company's policies, to be familiar with the company's ethics program, to foster an environment of compliance, or to avoid placing pressures on subordinates to act unethically. Many codes also assign specific compliance duties to senior executives, vice presidents, general managers, department heads, ethics committees or review boards.

The codes of 32 companies state the responsibility of all employees for compliance, which may include asking questions, seeking advice or reporting misconduct.

QUESTION 5

Does the company conduct employee training programs regarding the code?

Yes: 41 No: 1

There are almost as many varieties of ethics training programs as there are responding companies. Among the respondents that answered "yes," 38 companies stated that they have already trained, or are in the process of training, all of their employees principally involved in defense work. At three companies, ethics training is provided only to managers and certain other key personnel. Two of the three are planning new courses for all defense-related employees. Five other companies specified that they were revising or expanding their training programs, and two companies stated that they had expanded their programs during the reporting period.

The different companies use a wide variety of training formats. Several companies have comprehensive training programs with workshops tailored to employees at different levels or in different functions in the corporation. Other companies use a workshop format, but gear the workshops just to particularly sensitive functional areas, such as purchasing, accounting, contracts, or quality assurance. Still others use a presentation/briefing format for their ethics training. A number of companies do not segregate ethics from the rest of employee training, but integrate ethics modules into general or functional training courses.

Based upon analysis of companies' responses and accompanying documentation, as well as conversations with the examiners/reviewers, the Ethics Resource Center has grouped the ethics training programs into three categories with different training objectives. These categories are not necessarily mutually exclusive, but rather indicate differences in emphasis.

1) *Code awareness training* elaborates on standards contained in the company's code of ethics and illustrates how these standards apply to employees' day-to-day jobs.

2) *Compliance training* familiarizes employees with the provisions of federal procurement laws and regulations in such areas as timecharging, truth in negotiation, unallowable costs, and expense reporting. It also indicates the consequences to firms and individuals if laws or regulations are breached.

3) *Training in ethical decision making* strives to help managers recognize the ethical content and ramifications of business decisions and to give managers a framework for coping with complex issues and "grey areas."

The following figures show how many companies provide training of each type. Some companies provide more than one type of training, while others did not specify the objectives of their training programs.

• Code awareness	24
• Compliance with federal laws and regulations	17

• Ethical decision making	14
• Objectives not specified	6

In addition, 13 companies stated that they provide ethics training in functional areas. This training focuses on the special rules or the unique ethical issues that arise or vulnerabilities that exist in functional areas like purchasing, engineering, finance, or quality assurance. Eight companies also noted that they provide ethics or compliance training as part of management training.

Videos, cited by 29 respondents, are the materials most often used in ethics training programs. Nine companies use case studies, and a few companies employ viewgraphs, handout materials or quizzes. Six companies conduct question-and-answer sessions, four use lecture formats, and three conduct group discussions. Six programs include presentations by outside experts, and one company specified that it makes provision for managers to attend outside seminars devoted to ethics and compliance.

Some companies have especially innovative programs. One training program includes a video that presents 24 problem situations. After watching each situation, employees take a test; the correct answers are provided and discussed at the end of the session. Another company has produced a three-hour dramatization that traces the course of a particular contract from the original Request For Proposal to the final closeout. Different scenes portray difficult decision points, and analysis of each scene is provided based on company policy and federal procurement laws and regulations. Still another company provides training sessions in both English and Spanish at one facility located in an area with a large Hispanic population. Two signatories conduct conferences within their companies devoted to ethics and compliance.

Fifteen companies indicated that they currently offer ongoing training or refresher courses for at least some of their employees who have already participated in ethics training sessions. In many cases, ongoing training or follow-up courses are directed toward managers and certain functional areas such as purchasing. An additional nine companies have stated their intention to provide refresher training, and four more companies are contemplating doing so. Four companies stated that they currently retrain all employees on an annual basis or plan to do so.

The one company that responded in the negative to Question 5 had done likewise last year. At that time, the company had stated its intent to develop a formal ethics training program. This year, the company indicated that it expects to implement an employee training program regarding the code in the coming year.

QUESTION 6

Does the code address standards that govern the conduct of employees in their dealings with suppliers, consultants and customers?

Yes: 42 No: 0

Codes of ethics can provide employees guidance in dealing with groups that are external to the company, but deeply involved in its day-to-day business. For example, codes may address the need to deal honestly with suppliers and customers, forbidding bribery and kickbacks and restricting the giving and receiving of gifts and gratuities. They may require that the company contract only with suppliers and consultants who agree to abide by the same standards as the company's own employees.

All of the respondents' codes specifically address standards of conduct in relationships with suppliers and customers. Thirty-one of the codes specifically mention consultants. Five other companies include consultants under the category "suppliers of services," which their codes specifically address. The remaining six companies consider consultants to fall into the more general category of "suppliers, vendors, subcontractors or representatives."

Nine companies indicated that their codes require consultants to receive a copy of the code, forbid consultants to violate the code or federal procurement laws, or forbid employees to request consultants to do anything not permitted by company policy. For example, one company's code states, "Employees will not make use of third parties (agents, consultants, representatives, sponsors, family members, or any other person or organization) to do anything that is prohibited by [the company's] rules and policies or by public law." In addition, two companies stated that they attach a copy of the code to all consulting agreements or include language in all consulting agreements requiring consultants to adhere to company standards. Another company stated its intention to do so.

QUESTION 7

Is there a corporate review board, ombudsman, corporate compliance or ethics office or similar mechanism for employees to report suspected violations to someone other than their direct supervisor, if necessary?

Yes: 42 No: 0

Many companies noted that they prefer that employees report suspected violations to their supervisor whenever possible. However, employees may be reluctant in some cases to report allegations to their direct supervisors, particularly when the employee suspects his or her supervisor of wrongdoing. Accordingly, each of the respondents has some alternative reporting mechanism as well, and many have more than one. The following list shows the types of reporting mechanisms identified by the signatories:

• Ethics hotline	28
• Ethics ombudsman	21
• Ethics office or committee	15
• Post office box or other procedure for written allegations	15
• "Open door" policy	6
• Corporate review board	1
• Ethics Committee of the Board of Directors	1
• External, independent ombudsman	1

Many of the hotlines are staffed by ombudsmen, ethics directors or members of ethics committees. Other hotlines go to legal, security or internal audit departments or, in one case, to an external, independent ombudsman.

In addition to these special mechanisms, employees in the indicated number of companies are encouraged to report suspected violations to certain offices or individuals:

• Law department	14
• Controller/finance department	6
• Human resources department	5
• Internal audit	5
• Heads of departments or functional areas	2
• Specific senior executives	2
• Contracts department	2
• Executive office	1

One respondent mentioned that its hotline had received 79 calls during the year ending June 30, 1988, 15 of which involved suspicion of impropriety. Another company stated that it will soon have a full-time corporate ethics director as an additional avenue for reports of misconduct.

QUESTION 8

Does the mechanism employed protect the confidentiality of reports?

Yes: 42 No: 0

Respondents use a variety of methods to protect the confidentiality of reports. They frequently have two or three, and sometimes more, of the following policies and procedures:

• Provision for anonymous reporting	36
• Company pledge, policy, or instruction to handle all calls and reports in confidence to the extent possible	22
• Records kept in secure area	18
• Limited access to reports and records	17
• Company pledge/policy that retribution against "whistleblowers" will not be tolerated	13
• Names of reporting employees are removed from reports	10
• Reports identified by control numbers rather than by names of individuals involved	7
• Inquiries are handled only by designated personnel	7
• Use of hotline telephones that have "no trace" feature	3
• Communication with the reporting employee done away from his or her work station	3

• Reporting employee may request strict confidentiality	3
• Reporting employee's name not revealed without his or her permission, unless disclosure is unavoidable during an investigation	3
• Need for prior approval of management before dissemination of investigation information	3
• Reports are stamped "Confidential" or "Company Private"	2
• Calls to hotlines not included in lists of calls made from company phones	1
• Maintenance of files in separate data base	1
• Use of specially designated telex line	1

The telex line mentioned above has been implemented by one company and can be used from any of the company's locations worldwide. By use of a special command, an employee can send a telex that goes only to the corporate ethics director. Incoming messages carry no identification of the sending location, no copies are printed at the sending location, and no record of the transmittal is made in the sending terminal's log.

One company noted that it takes measures to safeguard the identities not only of reporting employees, but of suspected violators as well.

QUESTION 9

Is there an appropriate mechanism to follow up on reports of suspected violations to determine what occurred, who was responsible, and recommended corrective and other action?

Yes: 42 *No: 0*

Methods of investigating and adjudicating allegations of wrongdoing vary widely among the responding companies, making categorization difficult. Generally, an individual or office, such as an ombudsman, ethics director, ethics office, or law, audit or security department, has the principal responsibility for conducting investigations. Depending on the nature of the allegation, the individual or office may seek assistance from other areas within the company, such as operating management, human resources, corporate security, the law department, internal audit or contracts.

QUESTION 10

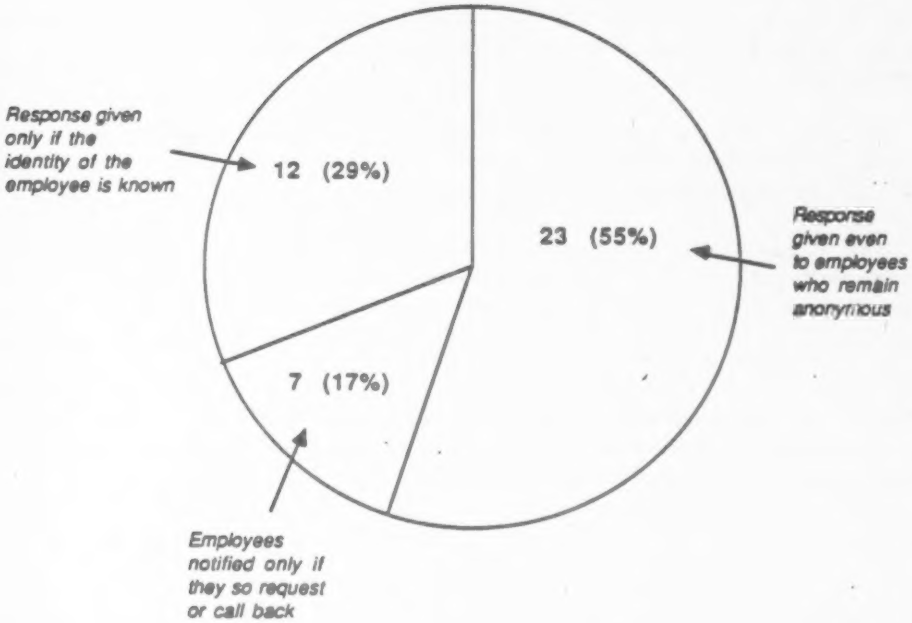
Is there an appropriate mechanism for letting employees know the result of any follow-up into their reported charges?

Yes: 42 *No: 0*

Each of the companies has a procedure for apprising employees of the results of the investigations into the allegations that the employees reported (see Chart 2). As one company noted

CHART NUMBER TWO

QUESTION 10: ***Is there an appropriate mechanism for letting employees know the result of any follow-up into their reported charges?***



in its response, "We have found that this practice promotes continued vigilance by the reporting employee and any others who might want to bring a possible infraction to our attention."

In 35 of the companies, an ombudsman, ethics director or manager is obliged to advise reporting employees concerning the results of the consequent investigations. (In some cases, the cognizant individual is required to document that he or she has followed up with employees who reported allegations.) Of the 35 companies, 23 have provisions for responding to employees who report anonymously; the procedure generally consists of arranging to have the employee call back. The number of companies specifying that they provide feedback to employees who report anonymously increased almost fourfold over last year. This increase may reflect not only the adoption of new procedures, but more detailed reporting of previously existing mechanisms in the companies' responses to the DII questionnaire.

In the other 12 companies, a response is provided only if the identity of the employee is known, although five of these companies try to publicize the results of some anonymous reports through company media, meetings, or public disciplinary or corrective action. Two of these 12 companies indicated that they are considering implementing a method to provide feedback to anonymous callers.

In the remaining seven companies, reporting employees receive feedback only if they so request or if they call back. Three of these companies specified that they make no provision for providing follow-up to employees who report anonymously.

One company noted that the reporting employee is not given any information about specific sanctions against any other employee, based on the company's longstanding philosophy that disciplinary action is strictly a matter between affected employees, their management and human resources.

QUESTION 11

Is there an ongoing program of communication to employees, spelling out and re-emphasizing their obligations under the code of conduct?

Yes: 42 No: 0

QUESTION 12

What are the specifics of such a program?
a) Written communication? b) One-on-one communication? c) Group meetings? d) Visual aids? e) Others?

All the companies have ongoing measures to increase awareness of the code and its provisions. The following breakdown indicates which methods are used.

a) Written communication

- Articles in company newspapers, newsletters and magazines 36

• Letters and memos to employees from senior management	21
• Distribution of ethics-related books and pamphlets other than the code	14
• Bulletins and notices addressing ethics or compliance matters	7
• Redistribution of the code of ethics	5
• Communications to suppliers	5
• Messages in pay envelopes or on pay stubs	4
• Inclusion of ethics-related material in annual reports	2
• Printed warnings about falsification of timecards	2
• Ethics communication resource kit or handbook	2
• Articles printed in external publications	2
• Internal circulation of externally published articles	2
• Reports circulated among managers	2
• Distribution of a copy of the code of ethics to sales representatives along with their annual quotas	1
• Wallet cards with guidelines for ethical decision making and instructions on where employees can go for assistance	1
• Inclusion of ethics as an aspect of the corporate credo	1

b) One-on-one communication

• Communication from supervisors	7
• Employee conversations with ethics office staff	3
• Follow-up interviews conducted by ombudsman	1
• Nature of communication unspecified	4

c) Group meetings

• Ethics presentations at meetings for managers and employees	8
• Departmental, divisional or staff meetings	6
• Management meetings	6
• Speeches by executives	2
• Meetings with ethics counselors	1
• Sessions of review board held in field offices	1
• Nature of meeting unspecified	7

d) Visual aids

• Videotapes	28
• Posters	26
• Viewgraphs and slides	3
• Badge extenders	2
• Video magazine	1
• Banners	1
• Plaques	1
• Unspecified	1

e) Other

• Use of employee opinion surveys as a means of communication about standards of business conduct	5
• Electronic/computer access to code, policies and other ethics materials	3
• Easy accessibility of forms for reporting violations	2
• Reviews of potential customers' ethics rules	1
• Telephone newsline including items about ethics	1
• Audio newsletter for employees	1
• Electronic mail	1
• Annual site visits by ethics director or assistant director	1
• Periodic reassessment of corporate credo	1
• Establishment of an ethics communication planning group	1
• Assessment of the adequacy of communications efforts	1

In addition, one company has designated "Ethical Decision Making" as an integral part of an employee program that outlines the basic attitudes and processes considered necessary for the future success of the company and its employees. Another respondent plans to extend its communication efforts to all corporate locations worldwide. The company plans to translate ethics materials and tailor the message to address the unique challenges of each country and location.

Several of these ethics communication efforts deserve further elaboration. Newsletter articles in several companies employ a question-and-answer format or present hypothetical scenarios to illustrate concrete applications of company policy. In one company, a whole issue of the corporate newsletter addressed ethics topics; one division in another company has a newsletter entirely devoted to ethics and compliance. Yet another company has developed a communication handbook with information about ethics both within and outside the company, from both the theoretical and practical standpoints. The handbook contains information for use in speeches, articles and brochures, as well as information in reproducible art form.

QUESTION 13

Does the company have a procedure for voluntarily reporting violations of federal procurement laws to appropriate governmental agencies?

Yes: 42 No: 0

In response to the Packard Commission report, both the defense industry and the Department of Defense moved to formalize procedures for voluntary disclosure of potential civil or criminal fraud matters.

The government's Voluntary Disclosure Program is described in "The Department of Defense Voluntary Disclosure Program: A Description of the Process" (September 1988). The foreword to the document states:

> The Department of Defense considers the Voluntary Disclosure Program to be a cornerstone of self-governance by Defense contractors and a manifestation of cooperative relations between Government and industry. The Voluntary Disclosure Program is not an amnesty or immunity program, but rather a means by which Defense contractors can bring to light potential civil and criminal fraud matters. . . . In return for disclosing potential fraud and fully cooperating in any Government audit and investigation of the matter, the Government generally allows the contractor the opportunity to conduct an internal investigation which the Government then attempts to verify in an expedited manner. The Department of Defense further agrees generally not to initiate administrative actions until its verification process is completed.

The document further states:

> The disclosures are made with no advance agreement regarding possible DoD resolution of the matter and with no promises regarding potential civil or criminal actions by the Department of Justice (DOJ). Prompt voluntary disclosure, full cooperation, complete access to necessary records, restitution, and adequate corrective actions are key indicators of an attitude of contractor integrity even in the wake of disclosures of potential criminal liability.

Procedures for voluntary disclosure to the government vary depending on the company. Typically, a review board, an ethics committee, a compliance officer, or the law department examines the results of internal investigations and either itself decides to make a voluntary disclosure to the government, or else makes its recommendation to the CEO or another senior executive who has the final decision about whether, when and how to disclose the alleged violation.

In accordance with the DoD's Voluntary Disclosure Program, contractors should disclose matters potentially involving fraud to the DoD Office of the Inspector General (DoD-IG). Routine matters that do not involve fraud are typically reported to the appropriate contracting officer or to the Defense Contract Audit Agency (DCAA).

Three companies specified that the decision to make such routine disclosures is made by the cognizant manager at the appropriate level in the company. Ten respondents indicated that they report routine matters to government contracting officers, the DCAA or other government personnel on an ongoing basis. Ten companies noted that they have established criteria for making decisions about disclosure. Typically these criteria include such factors as the weight of the evidence, the clarity of the law, whether the violation was deliberate or unintentional, whether there was any actual or intended pecuniary gain to any party as a result of the action, and whether there was a single act or a pattern of violations.

Of the 42 respondents to this year's questionnaire, 20 stated that they had made at least one voluntary disclosure to the DoD-IG during the reporting period. An additional 17 companies specified that they had made no such disclosures, while the remaining five companies did not specify or declined to comment.

According to the DoD-IG, 28 DII signatories have made voluntary disclosures to the DoD-IG from the outset of the program through December 5, 1988. DII signatories account for 79 of the 121 voluntary disclosures made as of that date.

QUESTION 14

Is implementation of the code's provisions one of the standards by which all levels of supervision are expected to be measured in their performance?

Yes: 40 No: 2

Most of the respondents indicated that implementation of their code's provisions is one measure of supervisory performance (see Chart 3). Some companies incorporate specific language about ethics or compliance into performance evaluation forms. Other companies factor implementation of the code's standards into supervisors' performance reviews in some general way. The following is a breakdown of the responses:

• Implementation of the code's provisions is a specific aspect of performance reviews	30
• Implementation of the code is included in some general way in performance evaluations	5
• Corporate policy states that implementation of the code is a standard for performance evaluation	4
• Company specifies disciplinary action for failure to uphold the code by employees or their subordinates	1

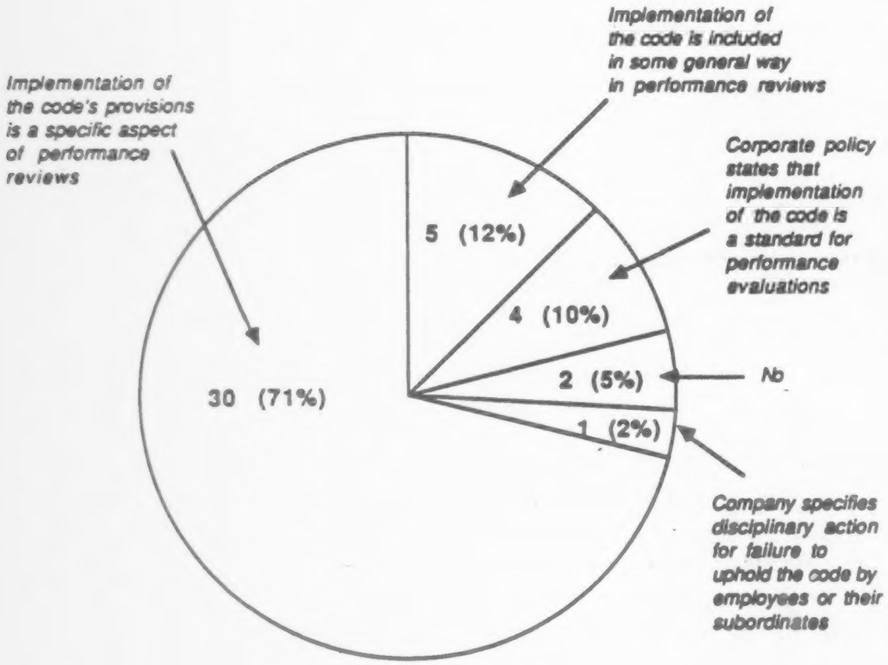
These figures demonstrate a strong trend toward making implementation of the code a specific aspect of supervisory performance evaluations, generally by adding language to this effect onto evaluation forms. Last year, only 13 respondents indicated that implementation of the code was a specific aspect of supervisors' evaluations.

One company noted that it has a separate form for evaluating supervisory performance under the code. Five companies answered "yes," even though they stated that some operating units were still implementing the inclusion of specific language about the code into evaluation forms, often because the units intended to use up existing stocks of the old forms before employing the new ones.

Of the two companies that answered "no" to Question 14, one was in the position of the

CHART NUMBER THREE

QUESTION 14: *Is implementation of the code's provisions one of the standards by which all levels of supervision are expected to be measured in their performance?*



aforementioned five companies. As of the end of the reporting period, two of the company's divisions had not yet introduced specific language about implementation of the code into their performance-evaluation forms, hence the company felt compelled to give a negative response. As of this writing, all of the company's operating units now have a specific category regarding the code on their evaluation forms. The other company that gave a "no" response noted that its code makes clear that the company will take disciplinary action in response to violations. (As noted above, another company considered such a practice justification for a "yes" response). However, the company indicated that it is still in the process of revising its evaluation forms to include language about the implementation of the code.

Three respondents stated that they are revising their performance review forms to incorporate language addressing implementation of the code, and one additional company is revising position descriptions along the same lines. One more company specified that it plans to revise its evaluation forms, but has not yet begun to do so.

Three companies have made implementation of the code a factor in management incentive bonus awards.

QUESTION 15

Is there a program to monitor on a continuing basis adherence to the code of conduct and compliance with federal procurement laws?

Yes: 42 No: 0

Many of the mechanisms listed by companies in their answers to Question 7 are also used to monitor compliance. The following is a breakdown of the responses:

• Compliance audits by internal audit department	38
• Monitoring by ethics office/committee/compliance officers	16
• Certifications regarding the code, conflict of interest, compliance or awareness of violations	14
• Oversight by general counsel/law department	8
• Monitoring by review board/contract compliance committee	7
• Compliance reviews conducted by management	6
• Review systems in functional areas	5
• Oversight by management and supervisors	5
• Monitoring by compliance group/department	5
• Self audits	4
• Financial audits by internal audit department	4
• Audits by independent public accountants	4
• Audits by accounting department	3
• Oversight by Board committees	3
• Reviews by outside counsel	3

• Attempts to assess employee awareness	3
• Analysis of violations to identify opportunities to improve policies, procedures and training	3
• Surveys regarding receipt of code or recertification	2
• Cooperation with vendors to ensure compliance	2
• Program to monitor emerging ethics issues and changes in federal procurement laws	2
• Monitoring by contracts department	1
• Monitoring of the programs of other DII signatories for ideas	1
• Ongoing review of the company's code	1
• Conflict-of-interest reviews for prospective employees coming from the government	1
• Quarterly reports from the ethics committee chairman of each operating unit to the corporate ethics committee chairman regarding efforts to foster ethics awareness and compliance	1
• System to monitor availability of hotline posters and forms for written submission of questions or allegations	1
• Annual reviews by general managers of operating units	1
• Requirements for reporting unusual financial transactions	1
• Reviews by ombudsman	1
• Monitoring by an independent outside committee	1
• Meetings to monitor how controls are working	1

As last year, reviews by the internal audit staff are the most widespread monitoring mechanism among DII signatories. These compliance audits review such activities as proposal preparation routines, labor and material charging practices, and testing procedures in order to ensure compliance with codes of ethics and with all federal procurement laws and regulations. One company noted in its response that "for both of the past two years, the Corporate Audit Staff has devoted the equivalent of fifteen people working full-time for a year to government contract compliance reviews around the Company."

Several monitoring mechanisms merit further elaboration. Some operating units of one company have established vendor hotlines so that suppliers can report allegations of misconduct by purchasing and contracting employees. Another company attaches a sticker to all purchase orders requesting suppliers to ensure that the company's employees act ethically in all purchasing transactions.

Several companies have mechanisms designed to spot potential problems before violations occur. Other companies monitor hotline calls, investigations and disciplinary actions on an ongoing basis to identify areas where improvements could be made in the company's ethics program. A few companies also have programs to identify emerging ethics or compliance issues in order to deal with these issues in a proactive manner.

In one company, a management team from one operating unit does an on-site review of another unit to evaluate the implementation of the programs, policies and procedures of the latter unit.

QUESTION 16

Does the company participate in the industry's "Best Practices Forum?"

Yes: 42 No: 0

All but one of the companies indicated that they had sent representatives to the 1988 "Best Practices Forum" in Dallas. In one case, the company stated that its representative was unable to attend the Forum because of last-minute extenuating circumstances. The company indicated that it has sent representatives to past Forums and plans to attend future ones. The company also stated that it received all the materials that accompanied the Dallas meeting.

QUESTION 17

Are periodic reports on adherence to the principles made to the company's Board of Directors or to its audit or other appropriate committee?

Yes: 41 No: 1

As with many other procedures covered in previous questions, methods of reporting to the Board of Directors about adherence to the code vary widely. In some companies, reports are made on a regular basis: monthly, quarterly, semi-annually, or annually. In other companies, reporting is done occasionally, or regular reports are supplemented by ad hoc reports as needed. Most respondents stated that a few specific individuals or groups present reports on ethics and compliance to the Board or its committees, as the following list indicates:

• Ethics director or ethics committee	20
• Internal audit or finance department	15
• General counsel	14
• Company's independent accountants	7
• Ombudsman/compliance officer	2
• Contracts department	2
• Corporate executives	1
• External, independent advisory panel	1
• Human resources department	1
• Independent counsel	1

The following summary indicates the parties to whom these reports are presented:

• Audit Committee	32
• Ethics/Corporate Responsibility Committee	9

• Full Board of Directors	6
• Legal Affairs Committee	1

Reports most frequently address the structure and activities of the company's ethics program and/or provide information about investigations of reported violations.

In one case, the only report made to the Board or its committees on adherence to the code's principles was by the outside auditors in connection with the DII questionnaire (see Question 18).

The respondent that answered negatively stated that its compliance officer has reported to corporate officers with regard to compliance practices. In the future, the compliance officer will also report to the Board of Directors.

QUESTION 18

Are the company's independent public accountants or a similar independent organization required to comment to the Board of Directors or a committee thereof on the efficacy of the company's internal procedures for implementing the company's code of conduct?

Yes: 42 No: 0

In 36 cases, the companies or their independent bodies stated that the independent bodies have made or intend to make specific comments to the company's Board or a committee thereof with regard to the efficacy of the company's procedures for implementing its code of ethics. Some of these comments have been accompanied by a management letter.

In one additional case, the independent body stated that it had made no comments on efficacy because it had not found any problems nor noted any potential improvements in the company's self-governance program. One independent body stated that it had not yet made its comments to the company's Board and that the nature of the comments it would make was not yet clear. Two companies have made arrangements for someone other than their independent bodies to make comments to the Board or its committees regarding the efficacy of the company's procedures. In one of these companies, the independent body has also made specific observations regarding efficacy.

One company's independent body refused to indicate whether it made specific comments to the company's Board of Directors regarding the efficacy of the company's program.

Finally, in two instances, companies gave a "yes" response to Question 18 even though the independent bodies indicated that specific comments regarding efficacy were made to management, not to the Board or any of its committees, as the question specifies.

In their responses to Question 18 or in accompanying materials, two companies noted the recommendations that their independent bodies had made last year and stated that the companies had acted on these suggestions. One independent body had recommended that the company place greater emphasis on ongoing communication; improve its audit plans for compliance monitoring to ensure the availability of the necessary staff; include specific language with regard to ethics on performance-evaluation forms; adopt tighter security measures for safeguarding databases containing information from employee allegations; provide contract labor employees with a copy of the code and appropriate compliance training; and improve procedures for providing responses to employees who have reported allegations of misconduct. Another independent body recommended the creation of a full-time position of ethics coordinator and the issuance of an ethics-awareness manual.

Yet another respondent noted in its answer to Question 18 that it had worked together with its independent body to create a "Company Best Practices" report outlining some of the more innovative or outstanding procedures found in the company's various locations.

IV. CONCLUSION

The responses to the annual DII questionnaire in 1988, the second year of the public-accountability process called for by the Initiatives, evidence a number of improvements over the policies, procedures and programs that were in effect during the first year of the Initiatives. Specific areas of improvement during the second year include the following (see Chart 4):

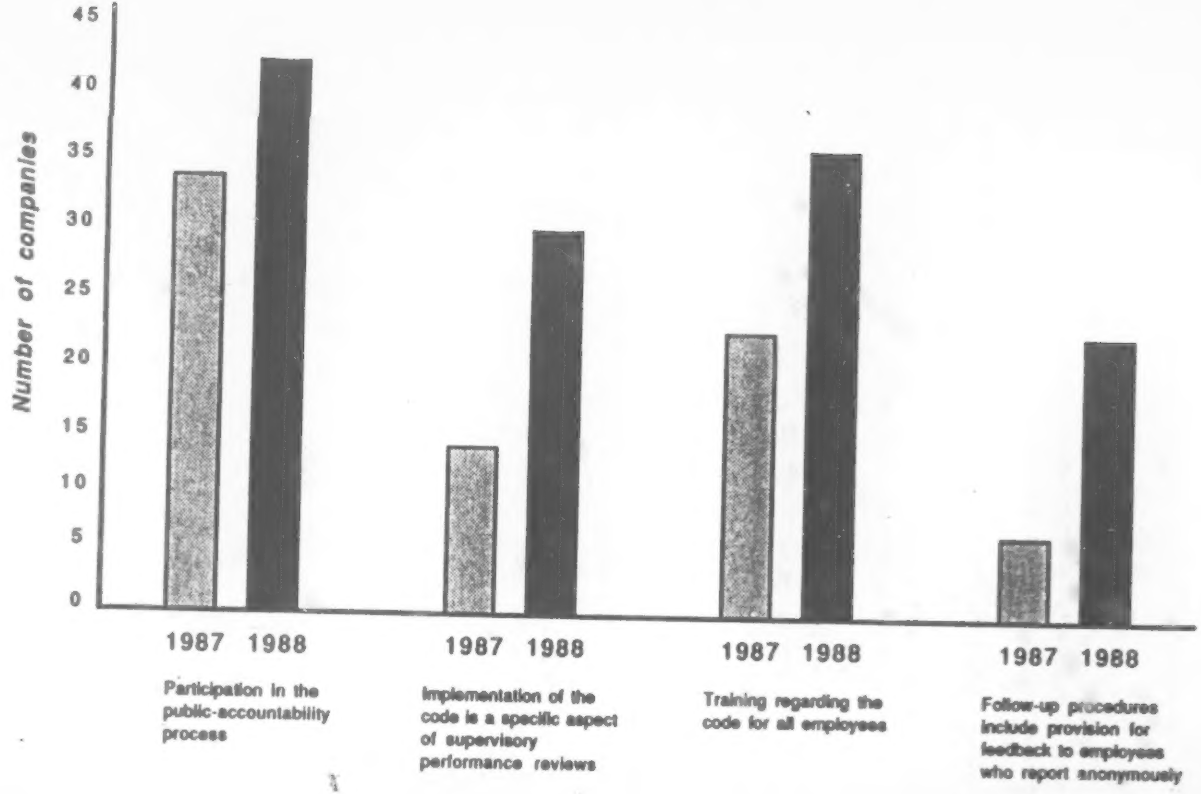
- There has been a 24 percent increase in the number of companies participating in the public-accountability process.
- The number of companies that include implementation of the company's code as a specific aspect of supervisory performance evaluations has more than doubled.
- An increasing number of companies are providing ethics and compliance training to all employees, not just to managers or to employees in certain functional areas.
- More companies now make provision for providing follow-up to employees who report allegations of misconduct anonymously.

While some of the signatories are still getting their policies, procedures and initial training and communication programs into place, others have had their self-governance programs in operation for several years. It is noteworthy that many companies with longstanding programs have mechanisms for ongoing review of the effectiveness of their codes, training programs, communication efforts and monitoring mechanisms. More than half of the respondent companies currently offer follow-up training to at least some employees, or are considering doing so. A few companies have stated their commitment to provide all employees with annual refresher courses on ethics and compliance.

As the self-governance movement launched by the Defense Industry Initiatives continues into its third year, the Center hopes that the signatory companies will ensure the vitality of the initiatives by examining, updating and improving their programs on an ongoing basis.

CHART NUMBER FOUR

COMPARISON OF SELECTED DATA, 1987-1988



DEFENSE INDUSTRY INITIATIVES
1988 ANNUAL REPORT

SUMMARY OF EXHIBITS

EXHIBIT 1	Defense Industry Initiatives on Business Ethics and Conduct
EXHIBIT 2	Defense Industry Initiatives Steering Committee and Working Group Members
EXHIBIT 3	Companies Participating in the 1988 Public-Accountability Process and Their Independent Bodies
EXHIBIT 4	Interpretation of Statement on Standards for Attestation Engagements, Attestation Standards: "Defense Industry Questionnaire on Business Ethics Conduct."
EXHIBIT 5	Description of the Role of the External Independent Body for the Defense Industry Initiatives
EXHIBIT 6	Ethics Resource Center, Inc.

EXHIBIT 1

Business Ethics and Conduct

The defense industry companies who sign this document already have, or commit to adopt and implement, a set of principles of business ethics and conduct that acknowledge and address their corporate responsibilities under federal procurement laws and to the public. Further, they accept the responsibility to create an environment in which compliance with federal procurement laws and free, open, and timely reporting of violations become the felt responsibility of every employee in the defense industry.

In addition to adopting and adhering to this set of six principles of business ethics and conduct, we will take the leadership in making the principles a standard for the entire defense industry.

I. Principles

1. Each company will have and adhere to a written code of business ethics and conduct.
2. The company's code establishes the high values expected of its employees and the standard by which they must judge their own conduct and that of their organization; each company will train its employees concerning their personal responsibilities under the code.
3. Each company will create a free and open atmosphere that allows and encourages employees to report violations of its code to the company without fear of retribution for such reporting.
4. Each company has the obligation to self-govern by monitoring compliance with federal procurement laws and adopting procedures for voluntary disclosure of violations of federal procurement laws and corrective actions taken.
5. Each company has a responsibility to each of the other companies in the industry to live by standards of conduct that preserve the integrity of the defense industry.
6. Each company must have public accountability for its commitment to these principles.

II. Implementation: Supporting Programs

While all companies pledge to abide by the six principles, each company agrees that it has implemented or will implement policies and programs to meet its management needs.

Principle 1: Written Code of Business Ethics and Conduct

A company's code of business ethics and conduct should embody the values that it and its employees hold most important; it is the highest expression of a corporation's culture. For a defense contractor, the code represents the commitment of the company and its employees to work for its customers, shareholders, *and* the nation.

It is important, therefore, that a defense contractor's written code explicitly address that higher commitment. It must also include a statement of the standards that govern the conduct of all employees in their relationships to the company, as well as in their dealings with customers, suppliers, and consultants. The statement also must include an explanation of the consequences of violating those standards, and a clear assignment of responsibility to operating management and others for monitoring and enforcing the standards throughout the company.

Principle 2: Employees' Ethical Responsibilities

A company's code of business ethics and conduct should embody the basic values and culture of a company and should become a way of life, a form of honor system, for every employee. Only if the code is embodied in some form of honor system does it become more than mere words or abstract ideals. Adherence to the code becomes a responsibility of each employee both to the company and to fellow employees. Failure to live by the code, or to report infractions, erodes the trust essential to personal accountability and an effective corporate business ethics system.

Codes of business ethics and conduct are effective only if they are fully understood by every employee. Communication and training are critical to preparing employees to meet their ethical responsibilities. Companies can use a wide variety of methods to communicate their codes and policies and to educate their employees as to how to fulfill their obligations. Whatever methods are used—broad distribution of written codes, personnel orientation programs, group meetings videotapes, and articles—it is critical that they ensure total coverage.

Principle 3: Corporate Responsibility to Employees

Every company must ensure that employees have the opportunity to fulfill their responsibility to preserve the integrity of the code and their honor system. Employees should be free to report suspected violations of the code to the company without fear of retribution for such reporting.

To encourage the surfacing of problems, normal management channels should be supplemented by a confidential reporting mechanism.

It is critical that companies create and maintain an environment of openness where disclosures are accepted and expected. Employees must believe that to raise a concern or report misconduct is expected, accepted, and protected behavior, not the exception. This removes any legitimate rationale for employees to delay reporting alleged violations or for former employees to allege past offenses by former employers or associates.

To receive and investigate employee allegations of violations of the corporate code of business ethics and conduct, defense contractors can use a contract review board, an ombudsman, a corporate ethics or compliance office or other similar mechanism.

In general, the companies accept the broadest responsibility to create an environment in which free, open and timely reporting of any suspected violations becomes the felt responsibility of every employee.

Principle 4: Corporate Responsibility to the Government

It is the responsibility of each company to aggressively self-govern and monitor adherence to its code and to federal procurement laws. Procedures will be established by each company for voluntarily reporting to appropriate government authorities violations of federal procurement laws and corrective actions.

In the past, major importance has been placed on whether internal company monitoring has uncovered deficiencies before discovery by governmental audit. The process will be more effective if all monitoring efforts are viewed as mutually reinforcing and the measure of performance is a timely and constructive surfacing of issues.

Corporate and government audit and control mechanisms should be used to identify and correct problems. Government and industry share this responsibility and must work together cooperatively and constructively to ensure compliance with federal procurement laws and to clarify any ambiguities that exist.

Principle 5: Corporate Responsibility to the Defense Industry

Each company must understand that rigorous self-governance is the foundation of these principles of business ethics and conduct and of the public's perception of the integrity of the defense industry.

Since methods of accountability can be improved through shared experience and adaptation, companies will participate in an annual intercompany "Best Practices Forum" that will bring together operating and staff managers from across the industry to discuss ways to implement the industry's principles of accountability.

Each company's compliance with the principles will be reviewed by a Board of Directors committee comprised of outside directors.

Principle 6: Public Accountability

The mechanism for public accountability will require each company to have its independent public accountants or similar independent organization complete and submit annually the attached questionnaire to an external independent body which will report the results for the industry as a whole and release the data simultaneously to the companies and the general public.

This annual review, which will be conducted for the next three years, is a critical element giving force to these principles and adding integrity to this defense industry initiative as a whole. Ethical accountability, as a good-faith process, should not be affirmed behind closed doors. The defense industry is confronted with a problem of public perception —a loss of confidence in its integrity—that must be addressed publicly if the results are to be both real and credible, to the government and public alike. It is in this spirit of public accountability that this initiative has been adopted and these principles have been established.

Questionnaire

1. Does the company have a written code of business ethics and conduct?
2. Is the code distributed to all employees principally involved in defense work?
3. Are new employees provided any orientation to the code?
4. Does the code assign responsibility to operating management and others for compliance with the code?
5. Does the company conduct employee training programs regarding the code?
6. Does the code address standards that govern the conduct of employees in their dealings with suppliers, consultants and customers?
7. Is there a corporate review board, ombudsman, corporate compliance or ethics office or similar mechanism for employees to report suspected violations to someone other than their direct supervisor, if necessary?
8. Does the mechanism employed protect the confidentiality of employee reports?
9. Is there an appropriate mechanism to follow-up on reports of suspected violations to determine what occurred, who was responsible, and recommended corrective and other actions?
10. Is there an appropriate mechanism for letting employees know the result of any follow-up into their reported charges?
11. Is there an ongoing program of communication to employees, spelling out and re-emphasizing their obligations under the code of conduct?
12. What are the specifics of such a program?
    a. Written communication?
    b. One-on-one communication?
    c. Group meetings?
    d. Visual aids?
    e. Others?

13. Does the company have a procedure for voluntarily reporting violations of federal procurement laws to appropriate governmental agencies?
14. Is implementation of the code's provisions one of the standards by which all levels of supervision are expected to be measured in their performance?
15. Is there a program to monitor on a continuing basis adherence to the code of conduct and compliance with federal procurement laws?
16. Does the company participate in the industry's "Best Practices Forum"?
17. Are periodic reports on adherence to the principles made to the company's Board of Directors or to its audit or other appropriate committee?
18. Are the company's independent public accountants or a similar independent organization required to comment to the Board of Directors or a committee thereof on the efficacy of the company's internal procedures for implementing the company's code of conduct?

EXHIBIT 2

DEFENSE INDUSTRY INITIATIVE STEERING COMMITTEE

Mr. Edward E. Hood, Jr., *Chairman*
Vice Chairman of the Board
GENERAL ELECTRIC COMPANY
Fairfield, Connecticut

Mr. Donald R. Beall
Chairman of the Board and
Chief Executive Officer
ROCKWELL INTERNATIONAL
Pittsburgh, Pennsylvania

Mr. Robert F. Daniell
Chairman and Chief Executive Officer
UNITED TECHNOLOGIES CORPORATION
Hartford, Connecticut

Mr. Joseph T. Gorman
President, Chairman and
Chief Executive Officer
TRW INC.
Cleveland, Ohio

Mr. Caleb Hurtt
President and Chief Operating Officer
MARTIN MARIETTA CORPORATION
Bethesda, Maryland

Mr. Thomas V. Jones
Chairman and Chief Executive Officer
NORTHROP CORPORATION
Los Angeles, California

Mr. Stanley C. Pace
Chairman and Chief Executive Officer
GENERAL DYNAMICS CORPORATION
St. Louis, Missouri

Mr. Malcolm T. Stamper
Vice Chairman of the Board
THE BOEING COMPANY
Seattle, Washington

Mr. Alan R. Yuspeh, *Coordinator*
Partner
Miller & Chevalier
Washington, D.C.

DEFENSE INDUSTRY INITIATIVE WORKING GROUP

Mr. Frank Menaker, *Chairman*
Vice President and General Counsel
MARTIN MARIETTA CORPORATION
Bethesda, Maryland

Ms. Zoe E. Baird
Counselor and Staff Executive
GENERAL ELECTRIC COMPANY
Fairfield, Connecticut

Mr. Ted Collins
Vice President and General Counsel
THE BOEING COMPANY
Seattle, Washington

Mr. Martin Coyle
Vice President, General Counsel
and Secretary
TRW INC.
Cleveland, Ohio

Mr. Kent Druyvesteyn
Senior Vice President
GENERAL DYNAMICS CORPORATION
St. Louis, Missouri

Mr. William M. Elliott
Senior Vice President and
General Counsel
NORTHROP CORPORATION
Los Angeles, California

Mr. Charles H. Harff
Senior Vice President,
General Counsel and Secretary
ROCKWELL INTERNATIONAL
Pittsburgh, Pennsylvania

Mr. Frank McAbee, Jr.
Vice President of Government Contracts
and Compliance
UNITED TECHNOLOGIES CORPORATION
Hartford, Connecticut

Mr. Alan R. Yuspeh, *Coordinator*
Partner
Miller & Chevalier
Washington, D.C.

EXHIBIT 3

COMPANIES PARTICIPATING IN THE 1988 PUBLIC-ACCOUNTABILITY PROCESS AND THEIR INDEPENDENT BODIES

1.	Allied-Signal Incorporated	Price Waterhouse
2.	American Telephone & Telegraph Company	Coopers & Lybrand
3.	BDM International, Incorporated	Coopers & Lybrand
4.	The Boeing Company	Touche Ross & Company
5.	CFM International Incorporated	Ernst & Whinney
6.	Computer Sciences Corporation	Touche Ross & Company
7.	DynCorp	Arthur Andersen & Company
8.	E-Systems, Incorporated	Ernst & Whinney
9.	Eaton Corporation	Ernst & Whinney
10.	FMC Corporation	Peat Marwick Main & Company
11.	Ford Aerospace & Communications Corporation	Coopers & Lybrand
12.	General Dynamics Corporation	Arthur Andersen & Company
13.	General Electric Company	Peat Marwick Main & Company
14.	Grumman Corporation	Arthur Andersen & Company
15.	Harris Corporation	Ernst & Whinney
16.	Harsco Corporation	Coopers & Lybrand
17.	Hercules Incorporated	Coopers & Lybrand
18.	Hewlett-Packard Company	Price Waterhouse
19.	Honeywell Incorporated	Deloitte Haskins & Sells
20.	Hughes Aircraft Company	Latham & Watkins, Esqs.
21.	ITT Defense Technology Corporation	Arthur Andersen & Company.
22.	International Business Machines Corporation	Price Waterhouse
23.	Learjet Corporation	Touche Ross & Company
24.	Lockheed Corporation	Arthur Young & Company
25.	Martin Marietta Corporation	Ernst & Whinney
26.	McDonnell Douglas Corporation	Ernst & Whinney
27.	Morton Thiokol, Incorporated	Ernst & Whinney
28.	Northrop Corporation	Touche Ross & Company
29.	Parker Hannifin Corporation	Coopers & Lybrand
30.	Raytheon Company	Coopers & Lybrand
31.	Rockwell International Corporation	Deloitte Haskins & Sells
32.	Science Applications International Corporation	Price Waterhouse
33.	Sundstrand Corporation	Grant Thornton & Company
34.	TRW Incorporated	Ernst & Whinney
35.	Teledyne, Incorporated	Arthur Andersen & Company
36.	Texas Instruments Incorporated	Arthur Young & Company
37.	Textron Incorporated	Arthur Young & Company
38.	Unisys Corporation	Arthur Young & Company
39.	United Technologies Corporation	Price Waterhouse

40. Varian Associates	Coopers & Lybrand
41. Westinghouse Electric Corporation	Price Waterhouse
42. Zenith Electronics Corporation	Arthur Andersen & Company

EXHIBIT 4

OFFICIAL RELEASES

ATTESTATION INTERPRETATION

The staff of the Auditing Standards Division has been authorized to issue interpretations to provide timely guidance on the application of pronouncements of the Auditing Standards Board. Interpretations are reviewed by members of that Board. An interpretation is not as authoritative as a pronouncement of the Auditing Standards Board, but members should be aware that they may have to justify a departure from an interpretation if the quality of their work is questioned.

Interpretation of Statement on Standards for Attestation Engagements, Attestation Standards: "Defense Industry Questionnaire on Business Ethics and Conduct"

Question—Certain defense contractors have made a commitment to adopt and implement six principles of business ethics and conduct contained in the *Defense Industry Initiatives on Business Ethics and Conduct (Initiatives).* One of those principles concerns defense contractors' public accountability for their commitment to the Initiatives. That principle requires completion of a *Questionnaire on Business Ethics and Conduct (Questionnaire),* which is appended to the six principles.

The public accountability principle also requires the defense contractor's independent public accountant or similar independent organization to express a conclusion about the responses to the *Questionnaire* and issue a report thereon for submission to the External Independent Organization of the Defense Industry (EIODI). (Appendices C and D to this Interpretation provide background information about the *Initiatives,* the six principles, and the required *Questionnaire.*)

A defense contractor may request its independent public accountant (practitioner) to examine or review its responses to the *Questionnaire* for the purpose of expressing a conclusion about the appropriateness of those responses in a report prepared for general distribution. Would such an engagement be an attest engagement as defined in Statement on Standards for Attestation Engagements, *Attestation Standards* (SSAE)?

Interpretation—SSAE defines an attest engagement as one in which a practitioner is engaged to issue or does issue a written communication that expresses a conclusion about the reliability of a written assertion that is the responsibility of another party. The questions in the *Questionnaire* and the accompanying responses are written assertions of the defense contractor. When a practitioner is engaged by a defense contractor to express a written conclusion about the appropriateness of those responses, such an engagement involves a written conclusion about the reliability of an assertion that is the responsibility of the defense contractor. Consequently, SSAE applies to such engagements.

Question—Paragraph 11 of SSAE specifies that a practitioner shall perform an attest engagement only if there are reasons to believe that "the assertion is capable of evaluation against reasonable criteria that either have been established by a recognized body or are stated in the presentation of the assertion in a sufficiently clear and comprehensive manner for a knowledgeable reader to be able to understand them." What are the criteria against which such assertions are to be evaluated and do such criteria provide a reasonable basis for the general distribution of the presentation of the assertions and a practitioner's report thereon?

Interpretation—The criteria for evaluating the defense contractor's assertions are set forth in the *Initiatives* and *Questionnaire*. The reasonableness of those criteria must be evaluated by assessing whether the assertions they generate (the questions and responses in the *Questionnaire*) have an appropriate balance of the relevance and reliability characteristics discussed in paragraph 15 of SSAE.

The criteria set forth in the *Initiatives* and *Questionnaire* will, when properly applied, generate assertions that have an appropriate balance of relevance and reliability. Consequently, such criteria provide a reasonable basis for the general distribution of the *Questionnaire* and responses and the practitioner's report thereon. Although the criteria provide a reasonable basis for general distribution of the practitioner's report, they have not been established by the type of recognized body contemplated in paragraph 13 of SSAE. Consequently, as required by paragraph 14 of SSAE, the criteria must be stated in the presentation of assertions in a sufficiently clear and comprehensive manner for a knowledgeable reader to understand them. This requirement will be satisfied if the defense contractor attaches the *Initiatives* and *Questionnaire* to the presentation of the assertions.

Question—What is the nature of the procedures that should be applied to the *Questionnaire* responses?

Interpretation—The objective of the procedures performed in either an examination or review engagement is to obtain evidential matter that the defense contractor has designed and placed in operation policies and programs that conform with the criteria in the *Initiatives* and *Questionnaire* in a manner that supports the responses to the questions in the *Questionnaire* and that the policies and programs operated during the period covered by the defense contractor's assertion. The objective does not include providing assurance about whether the defense contractor's policies and programs operated effectively to ensure compliance with the defense contractor's code of business ethics and conduct on the part of individual employees or about whether the defense contractor and its employees have complied with federal procurement laws. In an examination, the evidential matter should be sufficient to limit the attestation risk for the assertions to a level that is appropriately low for the high degree of assurance imparted by an examination report. In a review, this evidential matter should be sufficient to limit the attestation risk to a moderate level.

Examination procedures include obtaining evidential matter by reading relevant policies and programs, making inquiries of appropriate defense contractor personnel, inspecting documents and records, confirming defense contractor assertions with its employees or others, and observing activities. Illustrative examination procedures are presented in Appendix A. Review procedures are generally limited to reading relevant policies and procedures and making inquiries of appropriate defense contractor personnel. Illustrative review procedures are presented in Appendix E. When applying examination or review procedures, the practitioner should assess the appropriateness (including the comprehensiveness) of the policies and programs in meeting the criteria in the *Initiatives* and *Questionnaire*.

A particular defense contractor's policies and programs may vary from those of other defense contractors. As a result, evidential matter obtained from the procedures performed cannot be evaluated solely on a quantitative basis. Consequently, it is not practicable to establish only quantitative guidelines for determining the nature or extent of the evidential matter that is necessary to provide the assurance required in either an examination or review. The qualitative aspects should also be considered.

In an examination it will be necessary for a practitioner's procedures to go beyond reading relevant policies and programs and making inquiries of appropriate defense contractor personnel to determine whether the policies and programs that support a defense contractor's answers to specific questions in the *Questionnaire* operated during the period.

In determining the nature, timing, and extent of examination or review procedures, the practitioner should consider information obtained in the performance of other services for the defense contractor, for example, the audit of the defense contractor's financial statements. For multi-location defense contractors, whether policies and programs operated during the period should be evaluated for both the defense contractor's headquarters and for selected defense contracting locations. The practitioner may consider using the work of the defense contractor's internal auditors. The guidance in AU Section 322 may be useful in that consideration.

Examination procedures, and in some instances review procedures, may require access to information involving specific instances of actual or alleged noncompliance with laws. An inability to obtain access to such information because of restrictions imposed by a defense contractor (for example, to protect attorney-client privilege) may constitute a scope limitation. Paragraphs 63 through 66 of SSAE provide guidance in such situations. The practitioner should assess the effect of the inability to obtain access to such information on his or her ability to form a conclusion about whether the related policy or program operated during the period. If the defense contractor's reasons for not permitting access to the information are reasonable (for example, the information is the subject of litigation or a governmental investigation) and have been approved by an executive officer of the defense contractor, the occurrences of restricted access to information are few in number, and the practitioner has access to other information about that specific instance or about other instances that is sufficient to permit a conclusion to be formed about whether the related policy or program operated during the period, the practitioner ordinarily would conclude that it is not necessary to disclaim assurance.

If the practitioner's scope of work has been restricted with respect to one or more questions, the practitioner should consider the implications of that restriction on the practitioner's ability to form a conclusion about other questions. In addition, as the nature or number of questions on which the defense contractor has imposed scope limitations increases in significance, the practitioner should consider whether to withdraw from the engagement.

Question—What is the form of report that should be issued to meet the requirements of SSAE?

Interpretation—The standards of reporting in SSAE (paragraphs 45 through 70) provide guidance about report content and wording and the circumstances that may require report modification. Appendix B and Appendix F provide illustrative reports appropriate for various circumstances. Paragraph 46 states that the practitioner's report should refer to a separate presentation of assertions that is the responsibility of the asserter. The completed *Questionnaire* constitutes the presentation of assertions that should be referred to in the practitioner's report. The defense contractor should prepare a statement to accompany the presentation of the completed *Questionnaire* that asserts that the responses to the *Questionnaire* are appropriately presented in conformity with the criteria. An illustrative defense contractor statement is also presented in Appendix B and Appendix F.

The engagements addressed in this Interpretation do not include providing assurance about whether the defense contractor's policies and programs operated effectively to ensure compliance with the defense contractor's code of business ethics and conduct on the part of individual employees or about whether the defense contractor and its employees have complied with federal procurement laws. The practitioner's report should explicitly disclaim an opinion on the extent of such compliance.

Because variations in individual performance and interpretation will affect the operation of the defense contractor's policies and programs during the period, adherence to all such policies and programs in every case may not be possible. In determining whether a reservation about a response in the *Questionnaire* is sufficiently significant to result in an opinion modified for an exception to that response, the practitioner should consider the nature, causes, patterns, and pervasiveness of the instances in which the policies and programs did not operate as designed and their implications for that response in the *Questionnaire*.

When scope limitations have precluded the practitioner from forming an opinion on the responses to one or more questions, the practitioner's report should describe all such scope restrictions. If such a scope limitation was imposed by the defense contractor after the practitioner had begun performing procedures, that fact should be stated in the report.

A defense contractor may request the practitioner to communicate to management, the board of directors, or one of its committees, either orally or in writing, conditions noted that do not constitute significant reservations about the answers to the *Questionnaire* but that might nevertheless be of value to management. Agreed-upon arrangements between the practitioner and the defense contractor to communicate conditions noted may include, for example, the reporting of matters of less significance than those contemplated by the criteria stated in the *Initiatives* and *Questionnaire*, the existence of conditions specified by the defense contractor, the results of further investigation of matters noted to identify underlying causes, or suggestions for improvements in various policies or programs. Under these arrangements, the practitioner may be requested to visit specific locations, assess the effectiveness of specific policies or programs, or undertake specific attestation procedures not otherwise planned. In addition, the practitioner is not precluded from communicating matters believed to be of value, even if no specific request has been made.

APPENDIX A

ILLUSTRATIVE PROCEDURES FOR EXAMINATION OF ANSWERS TO QUESTIONNAIRE

DEFENSE INDUSTRY QUESTIONNAIRE ON BUSINESS ETHICS AND CONDUCT

Before performing procedures, the practitioner should read the Defense Industry Initiatives on Business Ethics and Conduct.

1. DOES THE COMPANY HAVE A WRITTEN CODE OF BUSINESS ETHICS AND CONDUCT?

Determine whether the Company has a written Code of Business Ethics and Conduct.

2. IS THE CODE DISTRIBUTED TO ALL EMPLOYEES PRINCIPALLY INVOLVED IN DEFENSE WORK?

a. Determine by inquiry of Company officials and/or by reading relevant documentation how the Company distributes the Code to all employees principally involved in defense work.

b. Obtain additional evidential matter, by positive confirmation of a selected number of employees or by other means, that the Code was distributed to employees principally involved in defense work.

3. ARE NEW EMPLOYEES PROVIDED ANY ORIENTATION TO THE CODE?

a. Determine by inquiry of Company officials and/or by reading relevant documentation how the Company provides an orientation to the Code to new employees.

b. Obtain additional evidential matter, by positive confirmation of a selected number of employees hired during the reporting period or by other means, that an orientation to the Code was provided at time of employment.

4. DOES THE CODE ASSIGN RESPONSIBILITY TO OPERATING MANAGEMENT AND OTHERS FOR COMPLIANCE WITH THE CODE?

Read the Code to determine whether it includes (a) the assignment of responsibility for compliance with the Code to operating management and others, and (b) a statement of the standards that govern the conduct of all employees in their relationships to the Company.

5. DOES THE COMPANY CONDUCT EMPLOYEE TRAINING PROGRAMS REGARDING THE CODE?

a. Determine by inquiry of Company officials and/or by reading relevant documentation how the Company conducts training programs regarding the Code.

b. Obtain additional evidential matter, by positive confirmation of a selected number of employees or by other means, that the Company conducted employee training programs regarding the Code for employees principally involved in defense work.

6. DOES THE CODE ADDRESS STANDARDS THAT GOVERN THE CONDUCT OF EMPLOYEES IN THEIR DEALINGS WITH SUPPLIERS, CONSULTANTS AND CUSTOMERS?

Read the Code to determine whether it addresses standards that govern the conduct of employees in their dealings with suppliers, consultants, and customers.

7. IS THERE A CORPORATE REVIEW BOARD, OMBUDSMAN, CORPORATE COMPLIANCE OR ETHICS OFFICE OR SIMILAR MECHANISM FOR EMPLOYEES TO REPORT SUSPECTED VIOLATIONS TO SOMEONE OTHER THAN THEIR DIRECT SUPERVISOR, IF NECESSARY?

Determine by inquiry of Company officials, observation, and/or by reading relevant documentation whether a corporate review board, ombudsman, corporate compliance or ethics office, or similar mechanism exists for employees to report suspected violations.

8. DOES THE MECHANISM EMPLOYED PROTECT THE CONFIDENTIALITY OF EMPLOYEE REPORTS?

a. Determine by inquiry of members of the corporate reviewboard, ombudsman, corporate compliance or ethics office, or similar mechanism established by the Company whether they understand the need to protect the confidentiality of employee reports.

b. Determine by inquiry of Company officials and/or by reading relevant documentation how the procedures employed protect this confidentiality.

9. IS THERE AN APPROPRIATE MECHANISM TO FOLLOW-UP ON REPORTS OF SUSPECTED VIOLATIONS TO DETERMINE WHAT OCCURRED, WHO WAS RESPONSIBLE, AND RECOMMENDED CORRECTIVE AND OTHER ACTIONS?

a. Determine by inquiry of Company

officials and/or by reading relevant documentation how the follow-up procedures established by the Company operate and whether an appropriate mechanism exists to follow-up on reports of suspected violations reported to a corporate review board, ombudsman, corporate compliance or ethics office, or similar mechanism to determine what occurred, who was responsible, and recommended corrective and other action.

b. Determine by inquiry of those responsible for performing such follow-up procedures how they document that the procedures were carried out.

c. Obtain additional evidential matter that the follow-up mechanism was employed by examining a selected number of reports of suspected violations from the log or other record of reports used by the corporate review board, ombudsman, corporate compliance or ethics office, or similar mechanism.

10. IS THERE AN APPROPRIATE MECHANISM FOR LETTING EMPLOYEES KNOW THE RESULT OF ANY FOLLOW-UP INTO THEIR REPORTED CHARGES?

a. Determine by inquiry of Company officials and/or by reading relevant documentation whether an appropriate mechanism exists for letting employees know the result of any follow-up into their reported charges.

b. For those items selected at Question 9 above, determine by inquiry of members of the corporate review board, ombudsman, corporate compliance or ethics office, or similar mechanism and by examining other evidential matter whether the results of the Company's follow-up of reported charges have been communicated to employees.

11. IS THERE AN ONGOING PROGRAM OF COMMUNICATION TO EMPLOYEES, SPELLING OUT AND RE-EMPHASIZING THEIR OBLIGATIONS UNDER THE CODE OF CONDUCT?

and

12. WHAT ARE THE SPECIFICS OF SUCH A PROGRAM?

A. WRITTEN COMMUNICATION?
B. ONE-ON-ONE COMMUNICATION?
C. GROUP MEETINGS?
D. VISUAL AIDS?
E. OTHERS?

a. Determine by inquiry of Company officials and/or by reading relevant documentation the extent of the Company's ongoing program of communication to employees, spelling out and re-emphasizing their obligations under the Code. Note the specific means of communication and compare to the Company's response to Question 12 of the Questionnaire.

b. Read announcements and other evidential matter in support of the actual program of re-emphasis.

13. DOES THE COMPANY HAVE A PROCEDURE FOR VOLUNTARILY REPORTING VIOLATIONS OF FEDERAL PROCUREMENT LAWS TO APPROPRIATE GOVERNMENTAL AGENCIES?

Determine by inquiry of Company officials and/or by reading relevant documentation how the Company's procedures operate for determining whether violations of federal procurement laws are to be reported to appropriate governmental agencies and examine evidential matter to determine whether such procedures are being implemented.

14. IS IMPLEMENTATION OF THE CODE'S PROVISIONS ONE OF THE STANDARDS BY WHICH ALL LEVELS OF SUPERVISION ARE EXPECTED TO BE MEASURED IN THEIR PERFORMANCE?

a. Determine by ihquiry of Company officials and/or by reading relevant documentation, such as position descriptions and personnel policies, whether performance evaluations are to consider supervisors' efforts in the implementation of the Code's provisions as a standard of measurement of their performance.

b. Obtain additional evidential matter to determine that supervisors are responsible for implementation of the Code's provisions.

15. IS THERE A PROGRAM TO MONITOR ON A CONTINUING BASIS ADHERENCE TO THE CODE OF CONDUCT AND COMPLIANCE WITH FEDERAL PROCUREMENT LAWS?

a. Determine by inquiry of Company officials and/or by reading relevant documentation how the Company monitors, on a continuing basis, adherence to the Code and compliance with federal procurement laws.

b. Obtain additional evidential matter, for example by reading internal audit reports, of the Company's monitoring of compliance with the Code and federal procurement laws.

16. DOES THE COMPANY PARTICIPATE IN THE INDUSTRY'S "BEST PRACTICES FORUM"?

Examine evidence of the Company's participation in the "Best Practices Forum."

17. ARE PERIODIC REPORTS ON ADHERENCE TO THE PRINCIPLES MADE TO THE COMPANY'S BOARD OF DIRECTORS OR TO ITS AUDIT OR OTHER APPROPRIATE COMMITTEE?

Determine by inquiry of Company officials and/or by reading minutes of the board of directors or audit or other appropriate committee meetings or other relevant documentation whether Company officials have reported on adherence to the principles of business ethics and conduct.

18. ARE THE COMPANY'S INDEPENDENT PUBLIC ACCOUNTANTS OR A SIMILAR INDEPENDENT ORGANIZATION REQUIRED TO COMMENT TO THE BOARD OF DIRECTORS OR A COMMITTEE THEREOF ON THE EFFICACY OF THE COMPANY'S INTERNAL PROCEDURES FOR IMPLEMENTING THE COMPANY'S CODE OF CONDUCT?

Determine by inquiry of Company officials and/or by reading relevant documentation whether the Company's independent accountants or a similar independent organization are required to comment to the board of directors or a committee thereof on the efficacy of the Company's internal procedures for implementing the Company's Code.

APPENDIX B

ILLUSTRATIVE DEFENSE CONTRACTOR ASSERTIONS AND EXAMINATION REPORTS

DEFENSE INDUSTRY QUESTIONNAIRE ON BUSINESS ETHICS AND CONDUCT

Illustration 1: Unqualified Opinion

DEFENSE CONTRACTOR ASSERTION

Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________.

The affirmative responses in the accompanying Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________ are based on policies and programs in operation for that period and are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Attachments:

Defense Industry Initiatives on Business Ethics and Conduct

Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________.

EXAMINATION REPORT

To the Board of Directors of the XYZ Company

We have examined the XYZ Company's Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________, and the Questionnaire and responses attached thereto. Our examination was made in accordance with standards established by the American Institute of Certified Public Accountants and, accordingly, included such procedures as we considered necessary in the circumstances. Those procedures were designed to evaluate whether the XYZ Company had policies and programs in operation during that period that support the affirmative responses to the Questionnaire. The procedures were not designed, however, to evaluate whether the aforementioned policies and programs operated effectively to ensure compliance with the Company's Code of Business Ethics and Conduct on the part of individual employees or to evaluate the extent to which the Company or its employees have complied with federal procurement laws, and we do not express an opinion or any other form of assurance thereon. In our opinion, the affirmative responses in the Questionnaire accompanying the Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________ referred to above are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Illustration 2: Unqualified Opinion; Report Modified for Negative Responses

DEFENSE CONTRACTOR ASSERTION

Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________.

The affirmative responses in the accompanying Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________ are based on policies and programs in operation for that period and are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Attachments

Defense Industry Initiatives on Business Ethics and Conduct

Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________.

(The responses could include an explanation of negative responses if the defense contractor so desired.)

EXAMINATION REPORT

To the Board of Directors of the XYZ Company

We have examined the XYZ Company's Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________, and the Questionnaire and responses attached thereto. Our examination was made in accordance with standards established by the American Institute of Certified Public Accountants and, accordingly, included such procedures as we considered necessary in the circumstances. Those procedures were designed to evaluate whether the XYZ Company had policies and programs in operation during that period that support the affirmative responses to the Questionnaire. The procedures were not designed, however, to evaluate whether the aforementioned policies and programs operated effectively to ensure compliance with the Company's Code of Business Ethics and Conduct on the part of individual employees or to evaluate the extent to which the Company or its employees have complied with federal procurement laws, and we do not express an opinion or any other form of assurance thereon.

In our opinion, the affirmative responses in the Questionnaire accompanying the Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________ referred to above are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire. The negative responses to Questions __________ and __________ in the Questionnaire indicate that the Company did not have policies and programs in operation during the period with respect to those areas.

Illustration 3: Opinion Modified for Exception on Certain Response

DEFENSE CONTRACTOR ASSERTION

Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________.

The affirmative responses in the accompanying Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________ are based on policies and programs in operation for that period and are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Attachments:

Defense Industry Initiatives on Business Ethics and Conduct

Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________

EXAMINATION REPORT

To the Board of Directors of the XYZ Company

We have examined the XYZ Company's Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________, and the Questionnaire and responses attached thereto. Our examination was made in accordance with standards established by the American Institute of Certified Public Accountants and, accordingly, included such procedures as we considered necessary in the circumstances. Those procedures were designed to evaluate whether the XYZ Company had policies and programs in operation during that period that support the affirmative responses to the Questionnaire. The procedures were not designed, however, to evaluate whether the aforementioned policies and programs operated effectively to ensure compliance with the Company's Code of Business Ethics and Conduct on the part of individual employees or to evaluate the extent to which the Company or its employees have complied with federal procurement laws, and we do not express an opinion or any other form of assurance thereon. In our opinion, except for the response to Question 10 as discussed in the following paragraph, the affirmative responses in the Questionnaire accompanying the Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________ referred to above are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Management believes that an appropriate mechanism exists for informing employees of the results of the Company's follow-up into charges of violations of the Company's Code of Business Ethics and Conduct, and has accordingly answered Question 10 in the affirmative. That mechanism consists principally of distributing newspaper articles and press releases of violations of federal procurement laws that have been voluntarily reported to the appropriate governmental agencies. We do not believe that such a mechanism is sufficient, in as much as it does not provide follow-up information on violations reported by employees that are not deemed reportable to a governmental agency. Consequently, in our opinion, the affirmative response to Question 10 in the Questionnaire is not appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Illustration 4: Opinion Modified for Exception on Certain Response; Report also Modified for Negative Responses

DEFENSE CONTRACTOR ASSERTION

Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________.

The affirmative responses in the accompanying Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________ are based on policies and programs in operation for that period and are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Attachments

Defense Industry Initiatives on Business Ethics and Conduct

Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________

(The responses could include an explanation of negative responses if the defense contractor so desired.)

EXAMINATION REPORT

To the Board of Directors of the XYZ Company

We have examined the XYZ Company's Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________, and the Questionnaire and responses attached thereto. Our examination was made in accordance with standards established by the American Institute of Certified Public Accountants and, accordingly, included such procedures as we considered necessary in the circumstances. Those procedures were designed to evaluate whether the XYZ Company had policies and programs in operation during that period that support the affirmative responses to the Questionnaire. The procedures were not designed, however, to evaluate whether the aforementioned policies and programs operated effectively to ensure compliance with the Company's Code of Business Ethics and Conduct on the part of individual employees or to evaluate the extent to which the Company or its employees have complied with federal procurement laws, and we do not express an opinion or any other form of assurance thereon.

In our opinion, except for the response to Question 10 as discussed in the following paragraph, the affirmative responses in the Questionnaire accompanying the Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________ referred to above are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire. The negative responses to Questions __________ and __________ in the Questionnaire indicate that the Company did not have policies and programs in operation during the period with respect to those areas.

Management believes that an appropriate mechanism exists for informing employees of the results of the Company's follow-up into charges of violations of the Company's Code of Business Ethics and Conduct, and has accordingly answered Question 10 in the affirmative. That mechanism consists principally of distributing newspaper articles and press releases of violations of federal procurement laws that have been voluntarily reported to the appropriate governmental agencies. We do not believe that such a mechanism is sufficient, in as much as it does not provide follow-up information on violations reported by employees that are not deemed reportable to a governmental agency. Consequently, in our opinion, the affirmative response to Question 10 in the Questionnaire is not appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Illustration 5: Opinion Disclaimed on Certain Responses Because of Scope Restrictions Imposed by Client

DEFENSE CONTRACTOR ASSERTION

Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________.

The affirmative responses in the accompanying Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________ are based on policies and programs in operation for that period and are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Attachments:

Defense Industry Initiatives on Business Ethics and Conduct

Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________

EXAMINATION REPORT

To the Board of Directors of the XYZ Company

We have examined the XYZ Company's Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________, and the Questionnaire and responses attached thereto. Except as explained in the following paragraph, our examination was made in accordance with standards established by the American Institute of Certified Public Accountants and, accordingly, included such procedures as we considered necessary in the circumstances. Those procedures were designed to evaluate whether the XYZ Company had policies and programs in operation during that period that support the affirmative responses to the Questionnaire. The procedures were not designed, however, to evaluate whether the aforementioned policies and programs operated effectively to ensure compliance with the Company's Code of Business Ethics and Conduct on the part of individual employees or to evaluate the extent to which the Company or its employees have complied with federal procurement laws, and we do not express an opinion or any other form of assurance thereon.

We were not permitted to read relevant documents and files or interview appropriate employees to determine that the affirmative answers to Questions 8, 9, and 10 are appropriate. The nature of those questions precluded us from satisfying ourselves as to the appropriateness of those answers by means of other examination procedures.

In our opinion, the affirmative responses to Questions 1 through 7 and 11 through 18 in the Questionnaire accompanying the Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________ referred to above are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire. Because of the matters discussed in the preceding paragraph, the scope of our work was not sufficient to express, and we do not express, an opinion on the appropriateness of the affirmative responses to Questions 8, 9, and 10 in the Questionnaire.

APPENDIX C

BACKGROUND

DEFENSE INDUSTRY QUESTIONNAIRE ON BUSINESS ETHICS AND CONDUCT

The June 1986 final report to the President of the United States, A Quest for Excellence, by the President's Blue Ribbon Commission on Defense Management (the "Packard Commission") included as an appendix the Defense Industry Initiatives on Business Ethics and Conduct (Initiatives) written by leaders in the defense industry and signed by many of the country's major defense contractors. The Initiatives, which were endorsed by the Packard Commission, set forth six principles of business ethics and conduct, which signatories to the Initiatives are committed to adopt and implement.

The sixth principle of business ethics and conduct specifies that "Each company must have public accountability for its commitment to these principles." The section of the Initiatives on implementation contains the following discussion of the sixth principle:

> The mechanism for public accountability will require each company to have its independent public accountants or similar independent organization complete and submit annually the attached questionnaire to an external independent body which will report the results for the industry as a whole and release the data simultaneously to the companies and the general public.
>
> This annual review, which will be conducted for the next three years, is a critical element giving force to these principles and adding integrity to this defense industry initiative as a whole. Ethical accountability, as a good-faith process, should not be affirmed behind closed doors. The defense industry is confronted with a problem of public perception—a loss of confidence in its integrity—that must be addressed publicly if the results are to be both real and credible, to the government and public alike. It is in this spirit of public accountability that this initiative has been adopted and these principles have been established.

Appendix D to this Interpretation reproduces in full the Initiatives, including the Questionnaire on Business Ethics and Conduct (Questionnaire).

Representatives of the signatories to the Initiatives have agreed that the defense contractor assertion illustrated in Appendix B and Appendix F, with the attachments thereto, is the appropriate vehicle for meeting the sixth principle referred to above. They also have agreed that each signatory should adopt and implement a code of business ethics and conduct that, in a self-contained document, addresses all of the required provisions of the six principles. In 1987, representatives of the signatories to the Initiatives created the External Independent Organization of the Defense Industry (EIODI) as the body to receive responses to the Questionnaire, report the results for the defense industry as a whole, and release the data to the companies and the public. The Auditing Standards Division of the American Institute of Certified Public Accountants, the EIODI, and representatives of the signatories to the Initiatives have agreed to a framework, which is embodied in this Interpretation, in which practitioners can accept engagements to attest to the answers to the Questionnaire and issue reports on the results of those engagements.

APPENDIX D

DEFENSE INDUSTRY INITIATIVES ON BUSINESS ETHICS AND CONDUCT AND QUESTIONNAIRE ON BUSINESS ETHICS AND CONDUCT[*]

BUSINESS ETHICS AND CONDUCT

The defense industry companies who sign this document already have, or commit to adopt and implement, a set of principles of business ethics and conduct that acknowledge and address their corporate responsibilities under federal procurement laws and to the public. Further, they accept the responsibility to create an environment in which compliance with federal procurement laws and free, open, and timely reporting of violations become the felt responsibility of every employee in the defense industry.

In addition to adopting and adhering to this set of six principles of business ethics and conduct, we will take the leadership in making the principles a standard for the entire defense industry.

I. Principles

1. Each company will have and adhere to a written code of business ethics and conduct.

2. The company's code establishes the high values expected of its employees and the standard by which they must judge their own conduct and that of their organization; each company will train its employees concerning their personal responsibilities under the code.

3. Each company will create a free and open atmosphere that allows and encourages employees to report violations of its code to the company without fear of retribution for such reporting.

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[*] From *A Quest for Excellence*, appendix, final report by the President's Blue Ribbon Commission on Defense Management, June 1986

4. Each company has the obligation to self-govern by monitoring compliance with federal procurement laws and adopting procedures for voluntary disclosure of violations of federal procurement laws and corrective actions taken.

5. Each company has a responsibility to each of the other companies in the industry to live by standards of conduct that preserve the integrity of the defense industry.

6. Each company must have public accountability for its commitment to these principles.

II. Implementation: Supporting Programs

While all companies pledge to abide by the six principles, each company agrees that it has implemented or will implement policies and programs to meet its management needs.

Principle 1: Written Code of Business Ethics and Conduct

A company's code of business ethics and conduct should embody the values that it and its employees hold most important; it is the highest expression of a corporation's culture. For a defense contractor, the code represents the commitment of the company and its employees to work for its customers, shareholders, *and* the nation.

It is important, therefore, that a defense contractor's written code explicitly address that higher commitment. It must also include a statement of the standards that govern the conduct of all employees in their relationships to the company, as well as in their dealings with customers, suppliers, and consultants. The statement also must include an explanation of the consequences of violating those standards, and a clear assignment of responsibility to operating management and others for monitoring and enforcing the standards throughout the company.

Principle 2: Employees' Ethical Responsibilities

A company's code of business ethics and conduct should embody the basic values and culture of a company and should become a way of life, a form of honor system, for every employee. Only if the code is embodied in some form of honor system does it become more than mere words or abstract ideals. Adherence to the code becomes a responsibility of each employee both to the company and to fellow employees. Failure to live by the code, or to report infractions, erodes the trust essential to personal accountability and an effective corporate business ethics system.

Codes of business ethics and conduct are effective only if they are fully understood by every employee. Communications and training are critical to preparing employees to meet their ethical responsibilities. Companies can use a wide variety of methods to communicate their codes and policies and to educate their employees as to how to fulfill their obligations. Whatever methods are used —broad distribution of written codes, personnel orientation programs, group meetings, videotapes, and articles—it is critical that they ensure total coverage.

Principle 3: Corporate Responsibility to Employees

Every company must ensure that employees have the opportunity to fulfill their responsibility to preserve the integrity of the code and their honor system. Employees should be free to report suspected violations of the code to the company without fear of retribution for such reporting.

To encourage the surfacing of problems, normal management channels should be supplemented by a confidential reporting mechanism.

It is critical that companies create and maintain an environment of openness where disclosures are accepted and expected. Employees must believe that to raise a concern or report misconduct is expected, accepted, and protected behavior, not the exception. This removes any legitimate rationale for employees to delay reporting alleged violations or for former employees to allege past offenses by former employers or associates.

To receive and investigate employee allegations of violations of the corporate code of business ethics and conduct, defense contractors can use a contract review board, an ombudsman, a corporate ethics or compliance office or other similar mechanism.

In general, the companies accept the broadest responsibility to create an environment in which free, open and timely reporting of any suspected violations becomes the felt responsibility of every employee.

Principle 4: Corporate Responsibility to the Government

It is the responsibility of each company to aggressively self-govern and monitor adherence to its code and to federal procurement laws. Procedures will be established by each company for voluntarily reporting to appropriate government authorities violations of federal procurement laws and corrective actions.

In the past, major importance has been placed on whether internal company monitoring has uncovered deficiencies before discovery by governmental audit. The process will be more effective if all monitoring efforts are viewed as mutually reinforcing and the measure of performance is a timely and constructive surfacing of issues.

Corporate and government audit and control mechanisms should be used to identify and correct problems. Government and industry share this responsibility and must work together cooperatively and constructively to ensure compliance with federal procurement laws and to clarify any ambiguities that exist.

Principle 5: Corporate Responsibility to the Defense Industry

Each company must understand that rigorous self-governance is the foundation of these principles of business ethics and conduct and of the public's perception of the integrity of the defense industry.

Since methods of accountability can be improved through shared experience and adaptation, companies will participate in an annual intercompany "Best Practices Forum" that will bring together operating and staff managers from across the industry to discuss ways to implement the industry's principles of accountability.

Each company's compliance with the principles will be reviewed by a Board of Directors committee comprised of outside directors.

Principle 6: Public Accountability

The mechanism for public accountability will require each company to have its independent public accountants or similar independent organization complete and submit annually the attached questionnaire to an external independent body which will report the results for the industry as a whole and release the data simultaneously to the companies and the general public.

This annual review, which will be conducted for the next three years, is a critical element giving force to these principles and adding integrity to this defense industry initiative as a whole. Ethical accountability, as a good-faith process, should not be affirmed behind closed doors. The defense industry is confronted with a problem of public perception—a loss of confidence in its integrity —that must be addressed publicly if the results are to be both real and credible, to the government and public alike. It is in this spirit of public accountability that this initiative has been adopted and these principles have been established.

Questionnaire

1. Does the company have a written

code of business ethics and conduct?

2. Is the code distributed to all employees principally involved in defense work?

3. Are new employees provided any orientation to the code?

4. Does the code assign responsibility to operating management and others for compliance with the code?

5. Does the company conduct employee training programs regarding the code?

6. Does the code address standards that govern the conduct of employees in their dealings with suppliers, consultants and customers?

7. Is there a corporate review board, ombudsman, corporate compliance or ethics office or similar mechanism for employees to report suspected violations to someone other than their direct supervisor, if necessary?

8. Does the mechanism employed protect the confidentiality of employee reports?

9. Is there an appropriate mechanism to follow-up on reports of suspected violations to determine what occurred, who was responsible, and recommended corrective and other actions?

10. Is there an appropriate mechanism for letting employees know the result of any follow-up into their reported charges?

11. Is there an ongoing program of communication to employees, spelling out and re-emphasizing their obligations under the code of conduct?

12. What are the specifics of such a program?

a. Written communication?

b. One-on-one communication?

c. Group meetings?

d. Visual aids?

e. Others?

13. Does the company have a procedure for voluntarily reporting violations of federal procurement laws to appropriate governmental agencies?

14. Is implementation of the code's provisions one of the standards by which all levels of supervision are expected to be measured in their performance?

15. Is there a program to monitor on a continuing basis adherence to the code of conduct and compliance with federal procurement laws?

16. Does the company participate in the industry's "Best Practices Forum"?

17. Are periodic reports on adherence to the principles made to the company's Board of Directors or to its audit or other appropriate committee?

18. Are the company's independent public accountants or a similar independent organization required to comment to the Board of Directors or a committee thereof on the efficacy of the company's internal procedures for implementing the company's code of conduct?

APPENDIX E

ILLUSTRATIVE PROCEDURES FOR REVIEW OF ANSWERS TO QUESTIONNAIRE

DEFENSE INDUSTRY QUESTIONNAIRE ON BUSINESS ETHICS AND CONDUCT

Before performing procedures, the practitioner should read the Defense Industry Initiatives on Business Ethics and Conduct.

1. DOES THE COMPANY HAVE A WRITTEN CODE OF BUSINESS ETHICS AND CONDUCT?

Determine whether the Company has a written Code of Business Ethics and Conduct.

2. IS THE CODE DISTRIBUTED TO ALL EMPLOYEES PRINCIPALLY INVOLVED IN DEFENSE WORK?

Determine by inquiry of Company officials and/or by reading relevant documentation how the Company distributes the Code to all employees principally involved in defense work.

3. ARE NEW EMPLOYEES PROVIDED ANY ORIENTATION TO THE CODE?

Determine by inquiry of Company officials and/or by reading relevant documentation how the Company provides an orientation to the Code to new employees.

4. DOES THE CODE ASSIGN RESPONSIBILITY TO OPERATING MANAGEMENT AND OTHERS FOR COMPLIANCE WITH THE CODE?

Read the Code to determine whether it includes (a) the assignment of responsibility for compliance with the Code to operating management and others, and (b) a statement of the standards that govern the conduct of all employees in their relationships to the Company.

5. DOES THE COMPANY CONDUCT EMPLOYEE TRAINING PROGRAMS REGARDING THE CODE?

Determine by inquiry of Company officials and/or by reading relevant documentation how the Company conducts training programs regarding the Code.

6. DOES THE CODE ADDRESS STANDARDS THAT GOVERN THE CONDUCT OF EMPLOYEES IN THEIR DEALINGS WITH SUPPLIERS, CONSULTANTS AND CUSTOMERS?

Read the Code to determine whether it addresses standards that govern the conduct of employees in their dealings with suppliers, consultants, and customers.

7. IS THERE A CORPORATE REVIEW BOARD, OMBUDSMAN, CORPORATE COMPLIANCE OR ETHICS OFFICE OR SIMILAR MECHANISM FOR EMPLOYEES TO REPORT SUSPECTED VIOLATIONS TO SOMEONE OTHER THAN THEIR DIRECT SUPERVISOR, IF NECESSARY?

Determine by inquiry of Company officials and/or by reading relevant documentation whether a corporate review board, ombudsman, corporate compliance or ethics office, or similar mechanism exists for employees to report suspected violations.

8. DOES THE MECHANISM EMPLOYED PROTECT THE CONFIDENTIALITY OF EMPLOYEE REPORTS?

a. Determine by inquiry of members of the corporate review board, ombudsman, corporate compliance or ethics office, or similar mechanism established by the Company whether they understand the need to protect the confidentiality of employee reports.

b. Determine by inquiry of Company officials and/or by reading relevant documentation how the procedures employed protect this confidentiality.

9. IS THERE AN APPROPRIATE MECHANISM TO FOLLOW-UP ON REPORTS OF SUSPECTED VIOLATIONS TO DETERMINE WHAT OCCURRED, WHO WAS RESPONSIBLE, AND RECOMMENDED CORRECTIVE AND OTHER ACTIONS?

Determine by inquiry of Company officials and/or by reading relevant documentation how the follow-up procedures established by the Company operate and whether an appropriate mechanism exists to follow-up on reports of suspected violations reported to a corporate review board, ombudsman, corporate compliance or ethics office, or similar mechanism to determine what occurred, who was responsible, and recommended corrective and other action.

10. IS THERE AN APPROPRIATE MECHANISM FOR LETTING EMPLOYEES KNOW THE RESULT OF ANY FOLLOW-UP INTO THEIR REPORTED CHARGES?

a. Determine by inquiry of Company officials and/or by reading relevant documentation whether an appropriate mechanism exists for letting employees know the result of any follow-up into their reported charges.

b. Determine by inquiry of members of the corporate review board, ombudsman, corporate compliance of ethics office, or similar mechanism whether the results of the Company's follow-up of reported charges have been communicated to employees.

11. IS THERE AN ONGOING PROGRAM OF COMMUNICATION TO EMPLOYEES, SPELLING OUT AND RE-EMPHASIZING THEIR OBLIGATIONS UNDER THE CODE OF CONDUCT?

and

12. WHAT ARE THE SPECIFICS OF SUCH A PROGRAM?

A. WRITTEN COMMUNICATION?
B. ONE-ON-ONE COMMUNICATION?
C. GROUP MEETINGS?
D. VISUAL AIDS?
E. OTHERS?

Determine by inquiry of Company officials and/or by reading relevant documentation the extent of the Company's ongoing program of communication to employees, spelling out and re-emphasizing their obligations under the Code. Note the specific means of communication and compare to the Company's response to Question 12 of the Questionnaire.

13. DOES THE COMPANY HAVE A PROCEDURE FOR VOLUNTARILY REPORTING VIOLATIONS OF FEDERAL PROCUREMENT LAWS TO APPROPRIATE GOVERNMENTAL AGENCIES?

Determine by inquiry of Company officials and/or by reading relevant documentation how the Company's procedures operate for determining whether violations of federal procurement laws are to be reported to appropriate governmental agencies.

14. IS IMPLEMENTATION OF THE CODE'S PROVISIONS ONE OF THE STANDARDS BY WHICH ALL LEVELS OF SUPERVISION ARE EXPECTED TO BE MEASURED IN THEIR PERFORMANCE?

Determine by inquiry of Company officials and/or by reading relevant documentation, such as position descriptions and personnel policies, whether performance evaluations are to consider supervisors' efforts in the implementation of the Code's provisions as a standard of measurement of their performance.

15. IS THERE A PROGRAM TO MONITOR ON A CONTINUING BASIS ADHERENCE TO THE CODE OF CONDUCT AND COMPLIANCE WITH FEDERAL PROCUREMENT LAWS?

Determine by inquiry of Company officials and/or by reading relevant documentation how the Company monitors, on a continuing basis, adherence to the Code and compliance with federal procurement laws.

16. DOES THE COMPANY PARTICIPATE IN THE INDUSTRY'S "BEST PRACTICES FORUM"?

Determine by inquiry of Company officials and/or by reading relevant documentation whether the Company participated in the "Best Practices Forum."

17. ARE PERIODIC REPORTS ON ADHERENCE TO THE PRINCIPLES MADE TO THE COMPANY'S BOARD OF DIRECTORS OR TO ITS AUDIT OR OTHER APPROPRIATE COMMITTEE?

Determine by inquiry of Company officials and/or by reading minutes of the Board of Directors or audit or other appropriate committee meetings or other relevant documentation whether Company officials have reported on adherence to the principles of business ethics and conduct.

18. ARE THE COMPANY'S INDEPENDENT PUBLIC ACCOUNTANTS OR A SIMILAR INDEPENDENT ORGANIZATION REQUIRED TO COMMENT TO THE BOARD OF DIRECTORS OR A COMMITTEE THEREOF ON THE EFFICACY OF THE COMPANY'S INTERNAL PROCEDURES FOR IMPLEMENTING THE COMPANY'S CODE OF CONDUCT?

Determine by inquiry of Company officials and/or by reading relevant documentation whether the Company's independent accountants or a similar independent organization are required to comment to the board of directors or a committee thereof on the efficacy of the Company's internal procedures for implementing the Company's Code.

APPENDIX F

ILLUSTRATIVE DEFENSE CONTRACTOR ASSERTION AND REVIEW REPORT

DEFENSE INDUSTRY QUESTIONNAIRE ON BUSINESS ETHICS AND CONDUCT

DEFENSE CONTRACTOR ASSERTION

Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________.

The affirmative responses in the accompanying Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________ are based on policies and programs in operation during that period and are appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire.

Attachments:

Defense Industry Initiatives on Business Ethics and Conduct

Questionnaire on Business Ethics and Conduct with Responses by the XYZ Company for the period from __________ to __________

REVIEW REPORT

To the Board of Directors of the XYZ Company

We have reviewed the XYZ Company's Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________, and the Questionnaire and responses attached thereto. Our review was made in accordance with standards established by the American Institute of Certified Public Accountants. Our review was designed to evaluate whether the XYZ Company had policies and programs in operation during that period that support the affirmative responses to the Questionnaire. Our review was not designed, however, to evaluate whether the aforementioned policies and programs operated effectively to ensure compliance with the Company's Code of Business Ethics and Conduct on the part of individual employees or to evaluate the extent to which the Company or its employees have complied with federal procurement laws, and we do not express an opinion or any other form of assurance thereon.

A review is substantially less in scope than an examination, the objective of which is the expression of an opinion on the affirmative responses in the Questionnaire accompanying the Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________. Accordingly, we do not express such an opinion.

Based on our review, nothing came to our attention that caused us to believe that the affirmative responses in the Questionnaire accompanying the Statement of Responses to the Defense Industry Questionnaire on Business Ethics and Conduct for the period from __________ to __________ referred to above are not appropriately presented in conformity with the criteria set forth in the Defense Industry Initiatives on Business Ethics and Conduct, including the Questionnaire. ■

EXHIBIT 5

DESCRIPTION OF THE ROLE OF THE DEFENSE INDUSTRY INITIATIVES EXTERNAL INDEPENDENT BODY

The function of the external independent body will be to report the results of the commitment to the Defense Industry Initiatives by compiling the audited questionnaires of the signatory companies to the Initiatives and to release a report of the data simultaneously to the companies and the general public. The report should explain the background of the Initiatives, the manner in which the questionnaires were completed, and the manner in which the questionnaires were reviewed by independent organizations for each company.

In preparing its report, the external independent body is to rely on the audited questionnaires submitted by the signatory companies and on interviews with representatives of the independent organizations as to the procedures followed by them in examining or reviewing the responses to the questionnaires. The report of the external independent body should be a self-contained document generally comprehensible to the general public and should serve in and of itself as an explanation of the activities undertaken by the signatory companies to achieve the goals of the Initiatives.

EXHIBIT 6

ETHICS RESOURCE CENTER, INC.

The Ethics Resource Center, Inc. is a private, non-profit organization working to strengthen public trust in business, government and other institutions of our society. The Center is non-partisan and non-sectarian. It was established in 1977 in response to growing concern among the public, elected officials, business executives and others about ethical standards and conduct in business and government.

The Center serves as both catalyst and resource for the development and implementation of ethics programs. The Center collects information on ethics issues and policies from all levels of business, government, education and the professions; provides analyses of the most critical and common problems; and develops programs to address these concerns. The Center advises corporations, trade associations, professional societies, municipal governments and federal agencies on the development and implementation of standards of ethical conduct.

At the request of the Packard Commission, the Center submitted recommendations regarding voluntary corporate measures to enhance ethical business conduct in the defense industry.

APPENDIX

SIGNATORY COMPANIES
JANUARY 1989

1. Allied-Signal Incorporated
2. American Telephone & Telegraph Company
3. BDM International, Incorporated
4. Bath Iron Works Corporation
5. The Boeing Company
6. CFM International Incorporated
7. Computer Sciences Corporation
8. Day & Zimmermann, Incorporated
9. DynCorp
10. E-Systems, Incorporated
11. Eaton Corporation
12. Emerson Electric Company (Government and Defense Group)
13. FMC Corporation
14. Ford Aerospace & Communications Corporation
15. General Dynamics Corporation
16. General Electric Company
17. Grumman Corporation
18. Harris Corporation
19. Harsco Corporation
20. Hercules Incorporated
21. Hewlett-Packard Company
22. Honeywell Incorporated
23. Hughes Aircraft Company
24. ITT Defense Technology Corporation
25. International Business Machines Corporation
26. Learjet Corporation
27. Lockheed Corporation
28. Loral Corporation
29. Martin Marietta Corporation
30. McDonnell Douglas Corporation
31. Morton Thiokol, Incorporated
32. Northrop Corporation
33. Parker Hannifin Corporation
34. Raytheon Company
35. Rockwell International Corporation
36. Science Applications International Corporation
37. Sundstrand Corporation
38. TRW Incorporated
39. Teledyne, Incorporated
40. Texas Instruments Incorporated

41. Textron Incorporated
42. Unisys Corporation
43. United Technologies Corporation
44. Varian Associates
45. Westinghouse Electric Corporation
46. Zenith Electronics Corporation

SUMMARY OF THE PROCEEDINGS OF THE DEFENSE INDUSTRY INITIATIVE ON BUSINESS ETHICS AND CONDUCT

BEST PRACTICES FORUM

Chicago, Illinois
May 24-25, 1989

Introduction

The fourth Best Practices Forum of the Defense Industry Initiative on Business Ethics and Conduct (DII) was held on May 24 and 25, 1989, in Chicago, Illinois. The Forum was attended by representatives of virtually all of the 47 DII signatory companies, as well as representatives of 17 non-signatory companies.

Ed Hood, Chairman of the DII Steering Committee and Vice Chairman of the Board of General Electric, welcomed the participants and thanked the Steering Committee; the Working Group and its Chairman, Frank Menaker; the DII Coordinator, Alan Yuspeh; and the signatory companies for their commitment and hard work to date. Mr. Hood began his remarks by acknowledging that the second ERC report verified that the signatories have all taken steps to meet both the letter and spirit of the six principles of the DII. He stressed that these ERC reports, however, should be seen only as a beginning, not an end, for DII. Mr. Hood addressed the importance of recognizing the DII as a set of enduring principles for the defense industry, not a quick fix. The Steering Committee believes that the public accountability process should therefore be extended beyond the original commitment of three years to enable the DII to achieve its objective of restoring public trust in the industry. The DII is proving that self-governance does work, but it has to work over time.

With regard to participation in the DII, Mr. Hood emphasized that broadening the base of signatories is critical for two reasons: to encourage the spread of best practices and the highest standards across the industry; and to ensure that the DII is taken more seriously by DOD. In addition, suppliers need to be encouraged to adopt the six principles, through, perhaps, the development of a more flexible prototype DII compliance program.

Mr. Hood acknowledged that good news seldom makes the news. Therefore, the DII needs to build a track record which demonstrates its commitment through actions, not words. In addition, the Bush Administration gives the DII both a responsibility and a new opportunity to reshape industry/DOD relationships. Through demonstrated greater public accountability, the DII can improve DOD's confidence in the defense industry, which will result in greater efficiency in the procurement process.

Mr. Hood stressed that the DII must continue to demonstrate that industry self-governance can work. This Forum, he stated, is critical to making the DII a lasting success.

from the top down and should be focused through natural communications channels.

With regard to formulating its training program, TI first conducted a literature search on the ethics question and then developed a 5-year "roadmap" to chart out the course. This "roadmap" is the superstructure of the company's ethics communications. The primary document, first published in 1961, is entitled "Ethics in the Business of TI." In conjunction with the primary document, TI gives live seminars to all exempt personnel, which are hosted by senior managers in the government contracting group and include discussions on ethical issues and a video on the government procurement environment.

TI also publishes the "Cornerstone" booklet series which gives examples of questions posed to the Ombudsman along with TI's answers. In addition, a selection of materials has been prepared to aid managers in conveying the message of ethics and business standards to their staffs.

Mr. Skooglund admitted that the seminars brought to light many problems on the issues of time reporting and overhead codes. As a result, TI has produced a pocket size guidebook with information on dealing properly with these topics. The guidebook lists people to contact for further information. In addition, the purchasing staff at TI are now developing workshops on the ethics of dealing with suppliers. Distrust in the open door process was also apparent and a team is currently investigating ways to solve this problem.

Mr. Skooglund added that TI has prepared an ethics survey to measure not only the activity, but also the effectiveness, of communications at TI. The TI ethics questionnaire has 21 questions which ask for answers on a seven-point scale. Mr. Skooglund reported that the responses to this survey were all anonymous and TI obtained a 50% response rate. Mr. Skooglund concluded by noting that TI is using the responses gained as baseline information from which it can judge future effectiveness in ethics training.

Question 8: Does the mechanism employed protect the confidentiality of employee reports?

Question 10: Is there an appropriate mechanism for letting employees know the result of any follow-up into their reported charges.

John Stewart was asked to address Questions 8 and 10. Mr. Stewart began his presentation by noting that prior to DII, IBM already had employee communication channels through their "Open Door" Policy and "Speak-Up" Program. In addition, IBM has had a long-standing management policy that allows unresolved problems to be taken to higher management at any level.

Regarding the specifics of the IBM "Speak-Up" Program, Mr. Stewart explained that each company location makes pre-addressed forms available to its employees. The form asks the employee to check boxes for required treatment, such as whether the reply should be mailed to a home address, whether the issues should remain confidential, and whether the employee would like to discuss the matter further. Mr. Stewart acknowledged that comments are transcribed and sent to management for a reply within 10 days; however, this time limit can be extended.

With regard to employee opinions of IBM's ethics program, Mr. Stewart noted that surveys are conducted every 18 months. He added that the major issues raised under "Speak-Up" vary greatly over time and only a small percentage involve issues that are related to the DII.

Question 14. Is implementation of the code's provisions one of the standards by which all levels of supervision are expected to be measured in their performance?

Frank Roach addressed Question 14. Mr. Roach's presentation highlighted implementation problems that TRW had with its appraisal process and the corrective actions taken.

Mr. Roach explained that the appraisal process is separated into two major employee classifications -- senior management and other managers. Senior managers are defined as those outside the normal evaluation process. Other managers are those who receive a standard annual evaluation. Initially, TRW had difficulty in obtaining accurate records from the Human Resources (HR) Department, which was responsible for maintaining evaluation records and for mailing out forms. In addition, he acknowledged that HR identified the class of employees they considered to be "supervisors", but were unable to produce an accurate listing of those individuals. Further, clearly defined completion dead lines were not established which subsequently delayed the entire process. In spite of its shortfalls, TRW's external auditors were satisfied with the goals of the appraisal program. However, Mr. Roach noted that the auditors made some major recommendations, including assigning line-management the responsibility for completing the forms and removing HR from the process. In addition, general managers are now responsible for obtaining a 100% completion rate and June 1, 1989 has been set as the date for baseline completion.

Mr. Roach had the following recommendations for companies with regard to their appraisal programs: a) clearly identify your universe; b) have an accurate list drawn up annually and then audit to that snapshot; c) tie-in form completion to general manager certification so that the general managers are involved; d) add completion to the internal audit for compliance; and e) carry out a pre-DII review by internal staff. The desired effects from these lessons learned are both to institutionalize the process and to make responsibility float down from the sectors to the groups.

Questions and Answers

There was then a question and answer session, with panelists being asked to elaborate on their programs, and most especially to comment on the question of evaluating employee confidence in company programs, on guaranteeing confidentiality of employee reports, and warning employees of the possibility of information being subpoenaed.

Presentation: The Honorable Griffin Bell

Judge Bell was recently asked by President Bush to serve as Vice Chairman of the President's Commission on Federal Ethics Law Reform. This Commission, Judge Bell acknowledged, has got off to a rocky start. By law, their meetings are open both to the general public and the press which has made the decision-making process very arduous. In addition, President Bush initially requested the Commission to report back after 40 days. The Commission's counsel of course immediately recommended they seek an extension.

Regarding the report's organization, Judge Bell explained that the Commission divided its work into three major focuses: what people should do when entering into government service; how they should behave once in the government; and how to proceed when returning to the private sector. One of the first things the Commission looked at was the high cost of taking a job with the government. Judge Bell noted that the Commission has recommended a tax rollover to cover divestiture of stock and has cleared this proposal with the Treasury Department. In addition, while conflict of interest considerations may pose an obstacle, financial disclosure regulations make it almost impossible for individuals to make the transition into government service. Judge Bell admitted that he had earlier encountered such disclosure forms and had managed to circumvent the necessity to complete them by changing the status of the position he was accepting. This time, however, upon accepting the Vice Chairmanship of the Commission, he felt obliged to fully complete the disclosure. He noted that after the initial 40-day mandate for the Commission, two members were still awaiting financial appraisals and had not been able to complete their disclosure.

For government employees, the Commission looked at such issues as bribery and gratuities. Judge Bell acknowledged that Washington is currently in a state of paranoia about such issues and is concerned about standards varying so greatly from department to department. He stressed that the Office of Government Ethics ought to issue standardized guidelines for behavior by developing a common law of ethics.

In addition, Judge Bell noted that Congress has often excluded itself from the legislation loop. In particular, Members are still allowed to receive a proportion of their income from honoraria while executive branch employees are prohibited from receiving such compensation. In addition, Judge Bell believed that judges deserve a pay raise, and should not have to wait for Congress to resolve its own dilemma over honoraria before granting such an increase. Judge Bell suggested that perhaps Congress could clean up its act by placing itself under the special prosecutor law applied to employees in the Executive Branch. He noted that the best way to get rid of a bad law is to enforce it.

Judge Bell concluded his presentation by suggesting that there should be an Office of Government Ethics for the executive branch, an Office of Congressional Ethics to regulate Congress (which is presently under no statutory restraint), and that Judges' conduct should be regulated under the judicial system which is well established and has been proved effective. Further, he noted that the economies of the world today are being driven by the principle of greed. New manifestations of this are currently being seen both in the USSR and, more recently, in China. The USA must be able to demonstrate that a successful market economy can function with honesty and mutual trust; both of which are vital to any society. The presumption of honesty has to be the very basis for doing business. In addition, the ethics problems should be ended and that the country should return to the point where trust forms the basis of the economy.

Presentation: The Honorable Don Atwood, Deputy Secretary of Defense

The presentation made by Deputy Secretary of Defense Atwood and the question and answer session that followed have been transcribed in their entirety and are attached.

Presentation: Morris Silverstein, Assistant Inspector General for Criminal Investigations Policy and Oversight, Department of Defense

Mr. Silverstein set out to explain the purposes of voluntary disclosure and the government's requirements for disclosure. Mr. Silverstein began by noting that in July 1986 and again in August 1987, Deputy Secretary of Defense William H. Taft, IV wrote to defense contractors outlining the proposed DOD program for voluntary disclosure. This proposal has now been incorporated into the booklet entitled "The Department of Defense Voluntary Disclosure Program - A Description of the Process" which has been distributed to defense contractors by DOD (copies of which were also circulated at the Forum).

In addition, Mr. Silverstein explained that the traditional government role in overseeing and auditing the work of defense contractors is viewed as being adversarial. The voluntary disclosure program attempts to take a cooperative relationship and engraft this relationship to law-enforcement. Many of the problems with voluntary disclosure result from a basic misunder-standing of this changeover in approach and attitude.

The purpose of voluntary disclosure is to obtain reports from contracting companies on potential civil or criminal fraud. Any other items should be addressed to the quality inspector. If the contractor for any reason discloses to the DCAA or DCIO rather than the AIG-CIPO, yet meets all other voluntary disclosure criteria, this will not preclude it from participation in the program.

The benefits of the program to the disclosing company are that the program effectively will delay any punitive action against the company until an investigation is complete. Under certain conditions it may also reduce punitive damages from triple to double. Although the language of the current legislation is ambiguous, it may also bar qui tam actions.

Mr. Silverstein cautioned that companies should prepare voluntary disclosure statements only where they have a reasonable belief that civil or criminal fraud has occurred. In addition, disclosure statements should fully and specifically identify the matter being disclosed.

However, DOD only views the disclosure as voluntary if:

1. No DOD audit etc. is imminent. But, the existence of a government investigation doesn't necessarily trigger a rejection if the contractor is unaware of it.
2. The disclosure benefits the organization rather than an individual.
3. The contractor takes restitutive action to prevent recurrence and disciplinary action against staff involved.
4. The contractor aids in the ensuing audit.

Other factors considered by DOD are timeliness, completeness, candidness, and cooperation. In addition, DOD cannot promise amnesty or immunity.

A legal concern has been raised regarding state action since a contractor can legally be considered as "the government" if it is acting for the government. This may lead to possible violations of the 4th and 5th Amendments, which in turn could prohibit or preclude government investigations.

When a contractor does carry out its own investigation, it must submit a thorough loss impact statement. This is essential to aid DOD in its own audit. The loss impact statement should contain a clear conclusion as to the effect and extent of the alleged fraud. If the contractor has completed a written report, a list of individuals interviewed and the subject matter discussed should be included. With regard to confidentiality of work product, there is no requirement for the submission of notes, memoranda, or tapes. A reasonable time to provide such a written report is 60 days although extensions have been granted.

The risks involved in non-disclosure are that the government may learn independently of the alleged fraud, which may preclude the contractor from carrying out its own internal report. In addition, an attempted cover-up of the alleged fraud may lead to additional charges such as obstruction of justice.

Mr. Silverstein acknowledged that, to date, the voluntary disclosure program has not been as successful as its proponents would like it to be. On the other hand, it has been more successful than its opponents like to admit. At present, the ratio of investigations carried out by the government to those instigated by voluntary disclosure is 2:1. In addition, there has been a total of 145 disclosures. Seven were not admitted into the program or were rejected because it was clear that the government was already investigating the matter and it appeared that the contractor's disclosure was triggered by the fact that the government was already reviewing the matter or that they knew that the government was just about to review the matter.

Regarding DII contractors, there have been 27 DII contractors which have admitted a total of 85 of the 145 disclosures. In addition, there have been no suspension or debarment of corporations. However, five individuals have been suspended or debarred.

In concluding, Mr. Silverstein emphasized that government and defense contractors have no option but to work together, both to safeguard the nation's defense and its defense industry, and to avoid further restrictive litigation from Washington.

Mr. Silverstein responded to questions from the floor relating to the XYZ agreement contained in the DOD Voluntary Disclosure Program, third party attorney/client privilege, and suspension and debarment agreements.

Panel Discussion Among Members of the Defense Advisory Panel on Government/Industry Relations.

This panel was moderated by Alan Yuspeh, DII Coordinator and Partner, Miller & Chevalier. The panelists were Allan Burman, Acting Director, Office of Federal Procurement Policy; William Reed, Director, Defense Contract Audit Agency; Robert Trimble, Vice President, Contracts, Martin Marietta Corporation; Kent Druyvesteyn and Morris Silverstein.

Alan Yuspeh began the discussion by explaining that in 1988, Congress passed the Defense Authorization Bill which created the Defense Advisory Panel on Government/Industry Relations (DAPGIR) to study four major issues. These issues are industry self governance, suspension and debarment, the alternative dispute resolution (ADR) process, and whether or not the panel should become permanent. Mr. Yuspeh also noted that in 1987 Congress felt that government/industry relations were so poor that it established advisory groups under Senator Bingaman. Their report, published in February 1988, put forward 18 recommendations for collective actions. The subjects of self-governance, suspension and debarment, and ADR required special attention and became the focus of DAPGIR.

Robert Trimble then spoke about his role on the self-governance subpanel of the DAPGIR and invited participants in the Forum to put forward ideas on the self-governance issue. Mr. Trimble acknowledged that the problems in self-governance are great. Many people feel that self-governance and voluntary disclosure are anti-American; yet another imposition on free market forces. The numbers of companies getting out of defense contracting over the last few years are shocking and reflect a lack of confidence on the part of contractors in the defense contracting process. While self-governance is still a thorny issue and mandatory self-governance is even more controversial, the industry must take action now to improve its reputation, and mandatory self-governance may well form part of the solution.

Allan Burman then explained that the panel has based its work on the following problem statement:

> "Some parts of industry have taken steps to institute self-governance programs while others have not. In addition a number of questions arise about the purpose and effectiveness of such programs on government/industry relations. These questions need to be addressed in order to explore and make suggestions on how these programs can enhance cooperation between the Department of Defense and industry."

Mr. Burman added that a report will be prepared by the end of August, then presented to the Secretary of Defense by the end of September. This report will focus on the responses to the following questions:

1a. Identify the universe - what are self-governance programs? (DII, CRAG, codes of conduct?)
1b. What is their purpose and whom do they serve?
2. Measurement. Are the self-governance program achieving their objectives. How is their effectiveness determined? Can the number of newspaper articles on fraud, waste, and abuse be considered an effective measure? (Since this is what Members of Congress notice.)
3. Should self-governance programs or elements of these programs be made mandatory?
4. What benefit might one get from having these kinds of programs? What effect should effective self-governance programs have on government/industry business relationships as government oversight?
5. What kind of self-governance programs do government contractors expect from those with whom they do business?

Mr. Trimble stated that the DAPGIR subpanel will be looking at ways to evaluate the success of self-governance. The DII is a model for self-governance programs which, so far, has been voluntary. CRAG-type programs are another form of self-governance which the subpanel will look at. Over 200 DOD contractors have formal ethics programs. These need to be evaluated in comparison with structured programs such as the DII. Since voluntary disclosure seems to have inhibited DII membership, can a good self-governance program can be developed which does not include voluntary disclosure.

Mr. Trimble added that there have been noticeable improvements in the procurement process over the past two years and that there is an increased awareness of the need for ethics programs. However, the DII does need to look closely at the problem of low membership and find ways to disprove the criticism that some signatories have not seriously embraced the program.

William Reed then explained that the term self-governance originated with the Packard Commission which identified three areas for improvement of contractor operations:

1. Standards of conduct for government contracting.

2. Effective internal controls and means to monitor them.
3. Effective independent oversight.

Principle 4 of the DII calls for corporate responsibility to the government, including self-governance. The CRAG is a tool to promote both the findings of the Packard Commission and Principle 4 of the DII by improving government oversight of business through shared responsibility and strengthened communications.

Mr. Reed stressed that effective internal controls can result in reduced government oversight. The key to CRAG is that DCAA's audits are affected by the reliability DCAA can place in contractors' systems of internal control. DCAA allocates resources on a risk-based planning approach which starts with a vulnerability assessment. Where DCAA is confident of the internal control, it will reduce oversight and redirect its audit work to areas of higher risk. CRAG neither imposes new regulations nor does it increase government authority for access to contractor records. The program is based on informal communication between the government and contractor representatives at the plant level.

So far, DCAA has completed training conferences in every region. All FAO managers (where DCAA is in residence) have been requested to sit down with contractors and familiarize them with the CRAG package. There is still a lot of distrust about the program. People have not yet realized that the CRAG can be viewed as a tool that fits into Principle 4 of the DII and the concept of self-governance as recommended by the Packard Commission.

Congress is looking closely at DCAA and its handling of contractor self-governance. Industry will have to work closely with the agency in order to build the trust and confidence required to prevent further Congressional involvement in this issue.

Questions and Answers

During the question and answer session, panelists commented on government perceptions of the DII. Mr. Reed, in particular, felt that the DII had already made a tangible difference in industry/DOD relations. He felt that the DII had cleared the way for introduction of the CRAG. He encouraged DII signatories to take care that their good intentions filter down from top management to middle management since he had frequently observed problems at this level. Quality leadership would seem to be the crucial factor in successful implementation of the DII principles.

Both Mr. Reed and Mr. Burman discussed the question of determining effectiveness of the DII. Mr. Silverstein added that since the defense contracting industry is so vast, DII will be hard-pressed to pass the "newspaper test" whereby the industry is no longer judged by the number of cases of potential fraud reported in the press. In addition, DII signatory companies must continue to work to improve both government and public perceptions of the industry. It is important to consider what the objectives of DII programs are; how the DII program within a company is affected by profit projections; and how bonus programs are designed. In addition, a gradual, but slow, change in public perceptions is already discernible.

Mr. Trimble added that the DAPGIR subpanel on self-governance will be looking at ways to measure the success (or otherwise) of DII-type programs. He welcomed input on this question from those attending the Forum. In addition, Mr. Trimble agreed with the comment from the floor that DII signatory companies should demonstrate good leadership qualities and publicize the true facts about the defense industry's efforts to clean up its act.

Mr. Reed was asked to comment on potential overhead savings due to reduced oversight for companies using CRAG. Mr. Reed acknowledged that there may be some net savings since, if less auditors are needed, costs will be lower. In addition, CRAG is a useful tool not only for possible cost reductions, but also for getting better overhead claims, and for reducing the number of disputes on unallowable costs between government agencies and contracting companies.

The panel moderator, Mr. Yuspeh, asked for comments on whether or not self-governance programs were achieving their objectives -- and if not, why? Mr. Druyvesteyn broke down misconduct into three distinct types: wilful and intentional wrongdoing; misconduct due to ignorance or misunderstanding; and apathy. DII signatory companies should be prepared to apprehend and sanction those involved in wilful and intentional wrongdoing; should raise awareness of ethical issues and provide a means of answering employees' questions to avoid misunderstanding and ignorance; and should provide leadership which sets the tone for impeccable standards of conduct -- and follow through in its own conduct to avoid apathy in its employees. Mr. Reed and Mr. Silverstein both mentioned that in the majority of cases that they had investigated, the employee in question felt that his or her conduct was endorsed by the company. Companies must lead by example and emphasize that no employee, at any level, ever has the authority to require others to partake in unethical conduct.

Small Groups Presentations

Group I - Zane Finkelstein, BMY- A Division of Harsco

Design an ideal training program.

Please indicate by categories of employee the number of hours of training per year that you think are necessary, the general content of the training to be provided, whether the training should be done on a contracted basis or in-house, what types of materials should be used, and how the effectiveness of the training should be measured. How much emphasis should be placed on contract compliance training versus ethical decision making training? How often should training be repeated? Should the training from year to year be a repeat of the same subjects, or should there be an effort to cover new subjects?

Group I concluded that there is no ideal training program. Any training program must focus on the needs of the individual organization and must address the question of what it is we're training people to do. People at all levels of the corporate ladder, including those at the top, should be trained properly. Training should be integrated into other communications channels since ethical behavior transcends all fields of business. Since repetition is the mother of learning, companies should not hesitate to repeat subject matter. However, it is important to use new techniques to convey the message; such as interactive videos and case studies.

There should be some outside involvement in the training program in order to bring in highly specialized people. But by far the best way to convey successfully the importance of ethical behavior is for training to be conducted by in-house personnel, preferably with the direct involvement of the CEO, President, or Vice President for Business Development. Anyone charged with the responsibility of developing an ethics program must not hesitate to involve upper management. All aspects of the program must come together in order that all employees are convinced that ethical behavior is a company-wide standard. Best of all, don't call such programs "training," call them "making business work," since ethical behavior and pride in a good job are major components of corporate success.

Group II - Bernie Fried, Textron, Inc. and Jacqueline Falconi, Parker Hannifin

Report on the elements of an ideal code of conduct and supporting materials.

How can codes of conduct be improved? Are codes reviewed periodically? Do they need to be reviewed periodically? Is it important that employees acknowledge in writing that the code has been received and read? Do the sample codes that you have been given for use in your discussion group appear to be effectively structured? How important is it to use hypothetical examples in addition to the code? Is a single code for all government employees appropriate? Is the general practice of the industry of having relatively lengthy and somewhat detailed codes the best approach?

Group II began by defining a company's code of conduct as its written code of ethics plus any supporting documentation. Since the ultimate goal of the code is communication, the code should cover policy and not procedure, it should be tailored to the organization in question (i.e. it should take into consideration company size, market, product, ratio of commercial/government contracts, etc.), it should be user-friendly, and it should be sufficiently inclusive to cover most issues for most employees.

An ideal code should be a dynamic, living document which should be updated as required. However, caution should be taken not to update the code too frequently since this may detract from its message. The code should be read by all employees; employees should be required to attest to having received the code. The group did not reach a consensus as to whether employees should also acknowledge in writing that they both understood and would comply with the code.

For maximum effectiveness, a code should demonstrate management commitment, starting with the CEO. It should contain a clear statement as to the company's mission and its values. The code should be brief, but care should be taken to include specific standards of conduct with examples; information on employees' obligation to report alleged misconduct or fraud without fear of retribution; discipline for non-compliance; and information on where to go for help.

In all companies, employees should be obliged to address their concerns and should be provided with an open environment in which to do so. Through all levels from the shop floor to the corporate office, employees should be encouraged to ask questions about the code and its implementation, and should receive follow-through and feedback from company management.

Group III - Harvey Bernstein, Computer Sciences Corporation

Design a model employee orientation program and ethics communication program.

What should the program consist of? Would you use videotapes? What items should be covered in the program? How should the code be presented? What type of document should the company give a new employee to sign with respect to the code? Is further orientation in divisions desirable or necessary? What can be done to enforce the message of the special responsibility of government contracting? How frequently should employees be communicated with? What should be the message of the communication? What are the objectives of such communication?

Group III felt that developing one standard model employee orientation program and ethics communication program was not possible. Instead, programs should be unique to each company's culture. Orientation to a company's code of corporate ethics should be integrated with general company orientation since this begins the communication process with new employees.

The basic principles of orientation programs are:

1. That effectiveness is a function of management involvement. Management has to be involved from the very top levels with communications flowing initially from the top down and ultimately with bi-directional communication.
2. That upper management should demonstrate commitment. Pride and responsibility should be evident at every level so that no employee can ever say that he or she felt they had been authorized to do something unethical.
3. That ownership at every level is essential. Every company employee must understand that the future of both the individual and the company depends on common sense and on good channels of communication.

Employees need to be encouraged to ask questions about the code. They must feel confident that they have a source for answers and guidance. Most of all, they must not feel embarrassed to ask "dumb" questions, since incorrect answers to such questions frequently lead to potentially unethical behavior.

Communication tools to adopt include employee surveys, peer discussion groups, company publications, posters, and videos. These tools should include information about the benefits to the company and the individual of following the principles of the DII. The key in all communications is to integrate the message into existing communications channels since ethics must be seen as an integrated part of the way companies do business.

While orientation programs communicate directly with employees, it is important to consider the secondary audience. In this case, the secondary audience is the general public. If the general public can regain faith in our industry, then we are well on the way to persuading Congress of our integrity.

Group IV - Ray Mur, Grumman Corporation

Design an ideal hotline/ombudsman system.

Should there be a central operation or decentralized operation? Should serving as an ombudsman or hotline answerer be a part time of a full time job? What type of training should individuals answering hotlines receive? How should the individuals answering hotlines follow up on calls they receive? Should the hotline be available to receive any type of call, or only certain types of calls? If only certain types of calls, which ones? How should anonymous calls be treated? What should callers be told about confidentiality? What should the ombudsman do with a report of an exceedingly troublesome set of facts? What kind of follow-up should be provided to those calling the hotline? How should this be done? Would the approach to the hotline system be different based upon differing sizes of companies? How would a system differ for a company of different size? Compare an appropriate system for a company with 1000 employees to a system for a company with 100,000 employees.

Group IV developed a list of nine essential components for an effective hotline/ombudsman system. These are:

1. CEO/Senior Management Support. Senior management has to be fully committed to a hotline or ombudsman within their company for it to be successful.
2. Communication. Good channels of communication are critical to the success of a hotline or ombudsman. Employees must be well informed about the system when it is first put into place and must receive on-going information about the hotline or ombudsman function.
3. Staffing. Responsibility for a corporate hotline cannot be an add-on function. If

someone from within the company -- rather than a new hire -- is taking on this role, then their other responsibilities should be reduced. A hotline operator can be a lower-level employee, but he or she must be a good listener, must have good interviewing skills, and must be able to treat reports in total confidence. An ombudsman should, if possible, be a senior employee from within the company, someone who has built up a good foundation of trust, who should have good listening and investigative abilities.

4. Training. Staff operating hotlines should have a thorough knowledge of the organization and should be properly trained in hotline procedures.
5. Investigative Authority/Capability. Ombudsmen/hotline staff should have a broad charter and a high reporting structure. They should be provided channels for direct access to the CEO or the Audit Committee.
6. Confidentiality/Anonymity. Employees must have confidence that their reports are treated as confidential. Investigations must be carried out without reference to the individual making the initial report. It is important to allow anonymous reporting to allay the fears of those making reports.
7: Appropriate Legal Involvement. A major legal consideration is whether to voluntarily disclosure issues raised through the hotline/ombudsman system.
8. Timely Feedback. Timely feedback is vital for the credibility of the system.
9. Formalized Procedures. A log/record of all calls or written allegations received should be maintained. Employees should feel free to contact the hotline operator or ombudsman on any subject whatsoever. However, the company should take steps to encourage resolution at the lowest level.

Group V - Howard Dunn, Grumman Corporation and Alda Jorgenson, General Dynamics Corporation

Design a system to factor into performance appraisals a supervisor's understanding and implementation of the code of conduct.

Please be specific about how this would be done. What questions, if any, would you place on an employee evaluation form? What guidance would you give individuals about answering these questions? Would you ask questions about the extent to which an individual embodied principles of the code in his own conduct, or about the extent to which the individual implemented the code, or both? If there are substantial questions about an individual's commitment to a company's ethics program, how serious a problem is this? (For example, if an individual had been heard to comment that the ethics program was merely the latest management fad and that there would be something else next year, what impact should that have on the individual's performance evaluation?)

In order to successfully answer this question, it is important to consider who should be measured, how the measurement should be made, what is to be measured, and what the significance of that measurement is.

In considering who should be measured, senior management could be identified as those people outside the formal evaluation system. Supervisors are difficult to identify -- identification criteria could include pay level, job function and classification, sensitivity of the position, or a combination of the above.

Most companies refer in their code to the evaluation of supervisors. There should be some system in place to audit the evaluation (perhaps by tying performance appraisals to merit increase). The group recommended having the evaluation apply both to supervisors and senior management. Some companies have experienced problems in coordinating these evaluations with the Human Resources (HR) department. Rather than cutting HR out of the loop, ways should be found to successfully coordinate with HR.

For senior management, performance appraisals must reflect only that conduct which is ethical. Input for the appraisal should be given by outside committees, the company ethics committee, and the audit committee. The compensation committee should act accordingly.

The group did not reach consensus on what to measure. Some participants recommended only very general questions, to be included in the regular evaluation, while others wanted detailed weighing of responses to very specific questions. They concluded that the preparation of an evaluation form was something that depended to a great extent on the culture of the individual company.

The significance of this process is to reinforce the idea that ethics are an integral part of doing business.

Group VI - Don Gore, Lockheed Corporation

Design a program to measure the efficacy of your corporate ethics efforts.

Please be specific about the role you would assign to all of the following, if any:

1. Internal audit
2. External audit
3. Employee surveys
4. Objective measurements of various aspects of the program

How would you propose to measure whether a company's message to its employees has been understood and is believed? How would you factor analyses of the correct functioning of a corporation's complex systems (cost estimating, inventory accounting, etc.) into your evaluation procedures? Is the integrity of corporate systems related to or connected with ethics in self-governance programs? If you proposed to do employee surveys, what specifically would be surveyed? Would it be useful to seek employee responses to hypothetical situations? Would it be useful to ask employees what their response to prior situations was?

Group VI concluded that it is very difficult to effectively measure attitudes and beliefs, therefore, the group chose to focus more on the question of evaluating efficacy. This is a qualitative rather than quantitative approach.

Firstly, identify what attributes are to be evaluated, then look at mechanisms and methods of evaluation. Attributes to be evaluated could include: the openness of the communications environment; employee awareness of ethical responsibility; employee knowledge of program use and resources; employee confidence in management's integrity and commitment, and senior management involvement; and employee commitment and willingness to use programs in place. To do this, one could look at the employee's comfort level, supervisor/manager receptiveness, statistics on use of hotlines, and other reporting procedures. To measure awareness levels, one could look at the training and establish how well employees understand the principles of the DII. One could also establish whether or not employees are sensitive to high-risk situations, whether they are aware of the existence of hotline or ombudsman programs, and if they know how to use them. Find out if employees have confidence in the system or if fear of retribution is a major factor.

Senior management involvement is a critical factor. The efficacy of their message can be evaluated by questioning lower level employees on their perceptions of senior management and of senior management commitment.

The main mechanisms for evaluation include the internal and external audits (both independent and government). Statistical analysis can be done by tracking reports from hotline and audit findings. Here, evaluate the levels of reports, categories, trends, and the ratio of anonymous versus identified callers. Focus groups can be a helpful tool in assessing employee attitudes,

Group VII - Marty Paskoff, Allied-Signal and Dick Maag, Ford Aerospace Corporation

Report to the Corporate Ethics Committee on the proper scope of an ethics program for DII purposes.

Specifically, which of the following types of activities should be addressed in the program:

1. Fundamental employee knowledge about relevant procurement laws and regulations.

2. Willingness of employees under all circumstances to follow directions from the company about their conduct.

3. Ability of employees to recognize and deal with ethical dilemmas in a way that the company would desire (for purposes of this item, an ethical

dilemma is considered to be a decision with ethical overtones where procurement laws, rules or regulations do not dictate a particular course of action)

4. Correct functioning of various corporate systems.

5. Ethical sensitivity of decisions of the corporation as an entity (e.g., willingness to tell the customer when it has established excessive testing requirements which, in the view of the contractor, are imposing substantial unnecessary costs on the government).

How much consensus does there seem to be about the extent to which any or all of these elements ought to be part of a corporate ethics effort?

In order to present the report requested, the group made several assumptions, namely; a) that the company in question does both commercial and DOD sales and does prime and subcontract work; b) that there is top management commitment both at the corporate and operating unit level; and, c) that the company recognizes there's a cost to comply with ethics commitment, yet view this on a cost-effective basis. There responses to the individual questions can be summarized as follows:

1. a. Current employees should be trained in risk areas.
   b. New hires should be trained within 3-4 months of hiring
   c. Individual training packages should be tailored to various functional department (since, for example, the emphasis for the purchasing department will be different than that of the quality department).
   d. The programs should be repetitive to cover changes in law and regulations.
   e. In-house training should be offered to suppliers without training of their own.

2. a. Employees must have the ability to question directions given to them.
   b. Such questioning needs an outlet outside of the normal reporting chain, e.g. by use of a hotline or through the legal department, with no fear of retribution.
   c. Enforce the principle that it is no excuse and not tolerated by the corporation to attempt to justify improper conduct by saying you were following orders. No supervisor ever has the authority to require improper conduct.

3. a. The company should enunciate a clear set of values.
   b. Employees should be trained in the value system so that it is understood.
   c. The employee should have a safety valve to question the application of the values in a specific context to avoid misunderstandings.

4. a. An ethics program does not encompass all systems.
   b. Monitoring and review are unnecessary for DII compliance.
   c. Corporate management must, as part of general management responsibility,

ensure compliance and sanctioning of systems.

d. An effective ethics program requires review/oversight of ethics program systems (hotlines, training, etc.).

5. a. Ethics programs should be directed at making employees sensitive to ethical problems of customers.
   b. The program must allow sensitive issues to be raised and discussed openly.
   c. When decisions are made, consideration should be taken for the ethical dilemmas involved.

The group added that an ethics program should be applied equally to commercial and DOD contracts while specific rules should recognize the difference between the two different business areas.

Group VIII - George Sammet, Martin Marietta Corporation

Design a program to ensure that subcontractors pursue DII type programs.

What actions should be taken to ensure that sub-contractors of DII signatories have appropriate self-governance programs? Should there be flow-down clauses in contracts? How can you be supportive of subcontractor efforts in this area without being patronizing?

Group VIII concluded that it is impossible to design any one program which will work effectively for all subcontractors. Consideration must be taken for the size and type of the subcontractor. Subcontractors should not be coerced into adopting a DII-type program, nor should such programs become simply block-checking exercises rather than adherence to a set of general principles.

The guidelines developed are as follows:

1. Avoid mandating an ethics program for subcontractors since the government will probably proceed to mandate your program.
2. Note that the government audience will want to see something more than just passive interest - they'll want to see action.
3. Don't make programs part of the "numbers game" - use them for good business reasons.
4. Do not confuse the number of DII signatories with the number of companies who are ethical.
5. No subcontractor can reject a request that he operate in an ethical manner, although he can object to the methodology.
6. Whatever program the subcontractor adopts, it must start at the top.
7. Since ethics is a perishable commodity, it must be continually reinforced.

Elements to consider for inclusion in the program are:

1. A letter to the CEO of the subcontractor.

2. Procurement workshops.
3. Prime contractor to offer assist subcontractor if desired through the use of the DII Library materials or its own ethics materials.
4. Reporting of prime's unethical acts via prime's hotline.
5. General managers' meetings.
6. Repetitive surveys of subcontractors to establish their perception of prime's standards of business conduct.

There should not be flow-down clauses in contracts since it must always be assumed that the subcontractor is ethical unless there is any information to the contrary. Prime contractors should expect subcontractors to operate in an ethical manner, but should not lay a costly, formal, auditable ethics process on him. If a prime contractor is concerned about a subcontractor's business practices the solution is simple - don't use that subcontractor.

Ethics are passed along in many ways other than through formal ethics programs, i.e. through total quality management, personnel policies, and defective pricing policies. It is in this totality that the ethics of the defense industry should be evaluated.

Group IX- Dean Luchsinger, Varian Associates

> Make a presentation to the Steering Committee of the DII on the subject of adding to the number of signatory companies.
>
> Is it important that the number of DII signatories be increased? If so, to what number, and how should this be done? Should companies encourage their subcontractors to become DII signatories? Is there any way in which the DII principles could be constructively amended that would encourage additional signatories? Should the public accountability process be changed? Should there be a different public accountability approach to smaller signatories? Should there be a waiver from participation in any public accountability process for smaller signatories?

Group IX first considered whether an expansion of the DII was necessary, and if so, how many participants should be encouraged to sign up. Since the current approach seemed unlikely to expand the membership base, the group also explored some possible concerns facing non-signatory companies and what could be done to address these concerns.

The DII must be expanded in order to lessen the likelihood of a DII-type program being mandated by Congress. The group suggested that the Steering Committee look at the question of an ideal level of membership.

Concerns frequently expressed by non-signatories include such issues as the perceived cost of implementation, recurring costs for training as well as hidden costs, the public accountability process, distrust of the voluntary disclosure process, fear of expansion of the DII Principles, and the lack of clearly defined benefits. Since most companies already have active ethics programs, it is difficult to quantify benefits. A general lack of awareness of the principles of DII was also cited as well as the feeling that, since such a program may soon be mandated, signing up at this time would not be to a company's advantage.

The following are recommendations put forward by the group for review:

1. Modify the public accountability process to a 3-year rather than annual cycle and allow voluntary participation in this process.
2. Publicize the DII through industry association recognition.
3. List the benefits of membership.
4. Survey non-members to find out whether they already have a self-governance program in effect, why they have not become signatories, and what concerns they have prohibiting participation.
5. Develop an associate membership program dependent on company size and resource constraints to allow sharing of existing materials. Companies could then progress from associate membership to full membership.

Group X - Frank McAbee, United Technologies Corporation

Make a presentation to your corporate CEO on recommendations for actions to implement the new procurement integrity provisions of Federal law.

What should a company do to implement these new regulations. Which individuals need to be involved? What are the specific steps in implementation? Please be detailed, list steps in order, and assign responsibility. What role should be played in this process by ethics training personnel, ombudsmen, the legal department, line management, and others? Can there be an overreaction to the law?

In establishing a procedure for implementation of contractor integrity regulation, the company should firstly establish corporate policy and revise the code of ethics to reflect any changes; and should then generate, distribute, and implement a procedure to assure that the company is meeting the requirements of regulation.

An outline of the recommended procedure is given as follows:

1. Summary of Regulation
   a. Affectivity Date (07/16/89)
   b. Three categories of activity affected
   c. Four prohibitions
   d. Definitions (from FAR)
   e. Contract types affected
   f. Certification requirement and $ threshold
   7. Penalties and sanctions for violation.

2. Gratuities Policy

   a. General
   b. Procurement officials

3. Proprietary and Source Selection Information
   a. Definitions
   b. List 9 types in "always" category
   c. How to deal with questionable/prohibited documents
      i. Who will answer questions?
      ii. Who reviews documents and decides disposition/disclosures?

4. Assignment of Responsibility
   a. Revolving door issues
   b. Designation of "person responsible"
   c. Initial and continuing listing of "PS&I" people
   d. Determination and notification of certification requirements
   e. Assure completion, review, and retention of PS&I certificates
   f. Approval of "Person Responsible" certificates (if any)
   g. Training of officers, employees, agents, representatives and consultants
      i. Awareness (everyone)
      ii. Detailed (certified people)

5. Dealing With Subcontractors

6. Dealing With Deviations/Violations

The group came up with several items for discussion:

1. Should PS&I certificates be prepared annually or "per procurement?"
2. Should the subcontractor be required to provide a certificate, or should he be liable for indemnification?
3. Should certificates be required from consultants, agents, and representatives?
4. Should special advisory committee members be included in the certification process?
5. What channels should be provided to pursue a protest of C.O. determination?
6. How should "hot" documents, obtained prior to the effective date of the regulations, be treated?
7. What procedure should be adopted with regard to "token" gratuities?

DII member companies have the clear advantage of having training programs already in place through which they can channel information on the new legislation.

DII Business Meeting

The purpose of the DII business meeting was to allow open discussion regarding the future course of the DII, with particular emphasis on the proposed DII By-laws. Mr. Menaker stressed that the DII has only a very small administrative staff and the proposed changes were not intended to add to the bureaucracy.

Concern was expressed about the expense of the DII public accountability process. Several participants felt that this was a major factor for small companies contemplating membership. Since the ERC has informed DII that it will not be able to prepare a report of the independent audits next year, an alternative must be found. Various options were discussed, including peer reviews, internal audits of questionnaires, and the use of external audit firms to prepare the report. A meeting of the DII Subcommittee on Public Accountability will be held in Washington in November. Any companies wishing to participate were urged to contact Mr. Marty Coyle, Chairman of the Committee, and a member of the DII Working Group and General Counsel of TRW Inc.

The modified By-laws of the DII, which have not yet been voted on, include proposals to rotate the membership of the Steering Committee and to have composition of the Working Group mirror company membership of the Steering Committee. Each committee would be responsible for selecting its own chairman.

It was felt that the more specific the principles and By-laws of the DII become, the more difficult it would be to attract and retain membership from all types of defense contractors. Membership in the DII should reflect a company's adherence to ethical codes of conduct, without necessitating a great expenditure of resources on bureaucracy.

Several representatives of non-signatory companies addressed the meeting. They collectively expressed concern about confusing language on voluntary disclosure, the public accountability process, the lack of defined benefits of membership, and fear of expansion of the DII.

Mr. Menaker introduced Mr. Will Ris from the government relations firm of Wexler, Reynolds, Fuller, Harrison & Schule, Inc. in Washington, D.C. This company will be exploring ways to improve the image and visibility of the DII in the eyes of Congress, DOD, and the public.

Charles Harff, a member of the DII Working Group and General Counsel of Rockwell International, felt that in order for the DII to achieve its objective of establishing credibility with DOD and Congress, it is still important for the industry to be united. To this end, perhaps a "model" DII program should be developed to aid the smaller potential signatories.

Presentation: James Burke, Johnson & Johnson

As Former Chairman and Chief Executive Officer of Johnson & Johnson, Mr. Burke spoke about his part in the development of that company's corporate credo, as well as how the credo and the company culture had guided Johnson & Johnson through the 1982 and 1985 Tylenol scares.

Mr. Burke began by noting that Johnson & Johnson is a very decentralized corporation, which encourages responsibility and creativity from its employees. The success of this structure is reflected in the company's continued growth. Johnson & Johnson bases its corporate philosophy on a credo; one very important aspect of which is that responsibility to the stockholder is placed after that clients, employees, and the communities it serves. Mr. Burke explained that this is both an ethical and a practical concept.

During the 1970's Mr. Burke reviewed the company's credo by inviting his managers from around the world to challenge the document. This process, which took almost four years to complete, resulted in a revised document which accurately reflects the company's corporate philosophy. This philosophy, ingrained into each employee, was what guided Johnson & Johnson during the days of the 1982 and 1986 Tylenol scares.

Mr. Burke has prepared a study of several major companies which have had a "credo" for at least 30 years. According to his figures, these companies have well out-performed the DOW average over this period. Johnson & Johnson itself has consistently maintained a compound growth rate of over 14% over the last 40 years.

Questions posed to Mr. Burke from the floor addressed procedures for employees wishing to report potential fraud, evaluation of success in gaining employee acceptance for the principles contained in the credo, and the handling of the Exxon oil spill in Alaska.

Mr. Burke commended the DII on its important work. He noted that the defense industry is in a difficult situation since the general public resents expenditure of "their" tax dollars on defense programs. In addition, Congress presently wields too much power over defense spending. He therefore recommended that the DII focus its attention more on the general public than on Congress since, ultimately, Members of Congress listen more closely to their constituents than to Washington lobbying groups. He recommended more openness about the work of the DII, and the high ethical standards of defense contractors in general. Ultimately, the defense industry's record should stand for itself. Mr. Burke's statement concluded the DII 1989 Best Practices Forum.

The Honorable Don Atwood
Deputy Secretary of Defense
May 24, 1989
1989 DII Best Practices Forum

It's a great pleasure for me to be here with you today, particularly because the Defense Industry Initiative is a group that I feel is doing a very worthwhile job. It's also a great thing for me to come back to New England -- I said New England, that's where I come from originally but I spent most of my adult life here in the Mid-West and did some time in Milwaukee for a period of about eight years and then spent time in Indianapolis and then in the town of Kokomo where Delco Electronics is located, and then most recently Detroit. We still call Detroit home. You know coming from New England you're always amazed by the culture that exists in the Mid-West although they do have their funny stories. And I recall when I first went to Delco Electronics in 1974 ... it's a small town of about 40,000 people and Delco at that time had about 15,000 employees so you can imagine that much of the economy depended on it. Every year they had a picnic in the summer for retirees and the first year that I was there they had this retirees picnic and there were about 1000 people. Amazing. They had games and they had food and so forth. And after lunch -- they had great big tents that everyone had lunch in -- they offered a series of prizes included in which was a prize for the oldest retiree there. And they started off at age 75 and said anyone just 75 please sit down. Everyone just 76 sit down. A significant number kept standing until 80 and then they began to drop off. At 89 there was just a lady who had been sitting beside me still standing and a man who was about three tables over. And they said would anyone just 89 years of age please sit down? And the lady sat down. They declared the man the winner, gave him his prize, and she turned to me and said "Darn, he wins every year." The next year we gave two prizes.

But seriously, what I want to talk to you today about is a couple of subjects. First of all I want to talk about the ethics rules and regulations that we're undergoing, what we're seeing, and how it's impacting people who are in the government and how it's impacting people who are about to go into the government. And then secondly I'd like to talk about how this impacts some of the changes I feel have to be made in the whole defense acquisition program.

To me, and I think to all of you, there is absolutely nothing more important than the honesty and integrity of our business. And it's especially important when that business is doing and working for the Defense Department. To this end, I strongly favor all companies having a written code of ethics signed by the top management. If it's going to happen at all, it's going to happen only if top management's behind it. And it's not going to happen if we publish a code of ethics signed by the Chairman and CEO, or by the President and COO, and when someone comes to work they're handed this and told "read it at your leisure." It's an ongoing situation. I think, frankly, that we have to have training programs for them, and that they should be updated so that there is absolutely no question as time goes on. It's a continuum that the top management stands behind the code of ethics that this industry has to live by and that everyone that works in the industry or works in that company has to know. We have an obligation to ourselves as the American public to conduct the business of defense on the highest possible moral and ethical plains. And when we fail to do so, suspicion, interference, added legislation, and added regulations become the norm. I understand from Ed Hood that he mentioned this morning, or either he or Judge Bell did, that the thought of Ill-Wind, in which we're dealing with probably over 1 million [people] in defense and industry has so impacted us, and when you go back and look at the numbers involved, it's pretty much a small handful of people who have literally contaminated the waters. When we don't do business with the appropriate standards of conduct, we invite this regulation. A good example is the new Section 27 Regulation on Procurement Integrity mandated by Congress. As many of you know, we did succeed in getting a 60-day extension. Frankly, DOD can't operate efficiently if we assume that people are basically dishonest and that's what the assumption is today. If we talk about 25 people who have committed a crime contaminating the works for the million who haven't and are going to work every day and doing their job in an honest fashion, and that we pass legislation because of that, then in fact we are truly muddying the waters.

Banks learned that many years ago. If they treated everyone who comes in to cash a check or do business as though he's a potential John Dillinger, they soon go out of business and they'd find that the overwhelming majority of people doing business with the banks are honest. And they treat them that way. And when they find someone that isn't, they prosecute that person to the full limit of the law. We, and I mean DOD and industry when I say we, have to police ourselves. Those who violate the law must be punished. We have to elevate the moral tone of our work willingly, voluntarily, and absolutely wholeheartedly. And when we do, legislation will become less and less necessary.

Now the saddest result of this mistrust generated by the perceived lack of integrity has been the terrible confrontational atmosphere that exists within our industry. Industry blames Congress and DOD. DOD blames industry and Congress, and Congress blames the whole damn world.

Firms in this industry are getting out in large numbers. All too often I hear leading CEOs say: "If we weren't in the defense business, we sure wouldn't get in it." Or, "We're going to increase the ratio of our commercial business." Or, as a minimum: "We're just going to hold our own, we don't like being treated as though we're criminals." And I don't blame you. Just four months ago, I was one of you.

From 1982 to 1987 the number of companies receiving contracts over $25,000 declined by 67%. Think of that. I'll tell you this. That if any company whether it be Ford Motors, or General Electric, or Martin Marietta, or General Motors, ever had the kind of relationship with its suppliers that DOD has with its suppliers, they'd soon go out of business from bankruptcy. They couldn't exist. We have to have an atmosphere in which

DOD is proud and pleased to have these suppliers. And that supplying industry is proud and pleased to be providing the kind of equipment, world-class quality, to DOD and proud to do business with them.

A major problem I see is the attempt to limit on what some believe are ethical grounds the legitimate exchange of managerial and technical expertise between government and industry. Public servants can make worthy contributions to private firms and business. People can bring valuable experience to the government. Closing, and I mean closing, the revolving door only increases the inefficiency of the acquisition process. We had legislation, but we've tightened it, and tightened it severely. Many high-ranking officials have left the government, and they left within the last three weeks, to avoid the uncertain impact which revolving door restrictions had on their future career opportunities. It wasn't that the law is crystal clear, it's that it's so ambiguous that in fact no-one, since it's a criminal offense, wanted to be the guinea pig and have it tried on them. Not only that, but we're finding it increasingly difficult to find qualified people willing to take their place. A fundamental problem is the penalties of government service far outweigh the benefits for many people in the business world.

I share with many people, with all of you, the legitimate concern that people in government should not benefit personally from their own decisions. However, the application of this principle has to be tempered by common sense and the plain truth is that the fears concerning financial disclosure laws and the need to avoid any conflict of interest are forcing people away from government service. I can say, and Judge Bell knows from my own experience, the extreme sacrifices one has to make in going into government service today. It isn't that you have to sell all your holdings, and that includes almost everything you own, and pay an enormous tax on it because they don't allow you to roll it over. You're selling things you probably would hold your whole lifetime and you have to pay the tax on it now. But it's that you have to take out additional steps to prove that you won't do anything dishonest.

In my case, since I approach retirement age, I have a pension, and I have a life insurance policy, and I have health care benefits. I had to take out three insurance policies to ensure that GM would not go bankrupt and if they did the insurance company would pay my pension, pay my health care benefits, and thus relieve me of the onerous responsibility of giving General Motors contracts so that they could make a profit and fund the pension fund so that fund could pay my pension. Think about it. Now the only thing that I had to give up that I couldn't fund is that I can't buy a GM car with any kind of a discount at all. But I have some friends that own them. They say they'll buy them and give them to me. I don't know.

The problem is that if we try to attract people who are in their 40s or 50s into government, the penalty they pay is a great reduction in income. It isn't everything they have to give up, but they give up any form of income over that entire period. And with the new restrictions on revolving door, they can't go back. And therefore we're having extreme difficulty in having people of capability, technical and managerial capability that we so desperately need, to come into the government because they give up everything that they have. They come in and they take a reduced salary and I defy you to live in Washington and maintain a home in Detroit, Michigan, for $89,000 a year. And then when you get out you can't go back. So what's happening is we're getting a lot of young people who have nothing to give up. It's a great experience. They're making as much as the would make if they went outside. Young people and older people. The people who are retired or are close to retirement. Now I don't hold anything against that latter crowd I want you to understand. But a lot of people reach that age and they want to retire. You're as old as you feel. And a lot of people ... the fire has gone out. But we're denied the opportunity to hire those dynamic people who have experience, who have capability, because frankly they simply can't afford it. And I think it's a terrible condemnation of our system that the government makes it so that it cannot benefit from it.

You know there's an analogy at McDonalds. McDonalds restaurants are finding themselves in the same situation. Their employees largely fit the same profile - a bipolar workforce of very young and very old. Now this has serious implications in defense acquisition. The responsibility for the development and production of our weapons systems is a divided one between government and industry. We long turned over the development and production of these to the private sector. Government's proper role is to set policy to determine how best to protect the American interests around the world. And in particular DOD determines what systems are needed and then industry does the development of them. Both groups have a fundamental role in it. But industry needs people who are capable of understanding and analyzing and are capable of managing these vast new programs.

Now I want to digress for a minute because some of the things that I'm going to say are what I feel have to be done in order to better the whole process within government. And they point out to me the great need for their having an ability to bring people in. Unfortunately, there are too many of our major weapons programs which are overrun, they are late in delivery or they have some technical performance deficiencies or some combination of the three and the question we have to ask is: "How do we go about fixing that?" And one could say: "Well, maybe that's industry's problem." One could say: "Maybe that's DOD's problem." Or: "That's Congress' problem." And depending on where you sit, you could blame any two of three, or any three of three. There are two things we need to do and need to do dramatically.

Number one is we need to have people who understand the stability of funding. It is absolutely critical that if we're to have a long-range weapons system program, concept and development, demonstration and validation, full-scale development, production and the logistics and maintenance phase, we have to have people in the government who understand that process and who understand that you have to have continuity in the way you fund it. And they have to sit down with Congress and explain just that. We need to do something about the continuity and stability of the funding of our programs.

But even more importantly, we need to have people who understand that as you go from one phase to the other. As you go from concept to demonstration and validation, or demonstration and validation to full-scale development, and so on, you need to have exit criteria so that it doesn't move forward unless a program has passed all those criteria. For instance, before we should go to large-scale production we should be sure that our tests are complete; that our prototypes and our pilot models have gone through the kinds of tests which indicate that they are ready for completion. All too often we look at a program that is overrun, late, doesn't have the technical performance that it should have, and you will find absolutely that is has slid from one phase to another. And everyone has said: "I know that the pilots didn't pass the test criterion and I know that we didn't complete it, but if you don't do something now ..." and so forth and so on. And we slide it through and by the time it gets into production you've got just a horrible mess on our hands. And that's exactly what's happening.

Now there's one other thing that I think is vital. And this involves many of you. And that is you know that how you save money in the long run is during the production phase if it's a producible design and during the logistics phase and maintenance phase if it's a quality design and a reliable product. And good commercial practices indicate that during the concept and the validation phase and during the development phase is when you put your money in. That's when you bring in the manufacturing engineering. They work hand-in-glove with the designers to ensure that you build a design that's producible. All too often today the engineers design it. They toss the designs over the transom and say: "Good luck, build it." That isn't the way to do it. They've go to work together. They've got to make a design that's producible, simple, reliable, capable of handling and high quality. How do we do it?

Very often, most often, almost in the predominance of times, we say: "Well, you've only got $50 million and I know it's going to cost you $100 million to go through this development phase. Why don't you do it and we'll give you a fixed price contract and cost sharing. Now I know what I'd do if I'm on the other side. I'd do everything I could do to scrimp and save and save that investment and hope that what I did spend I could get back in production. We save money on the wrong end of the stick and we've got to get off this business of cost sharing, fixed-price development contracts. That is absolutely, completely detrimental to what we are trying to accomplish.

There are many other aspects of this that I could go on and on and on about that I think need to be fixed and that we are working on. I am absolutely appalled at the gross micromanagement that goes on both within DOD and within the government, within Congress. We select the brightest, most promising young officers and make them program managers. And we say: "This is a great opportunity for you, you're going to be a program manager of X weapons system." In industry, if you make someone program manager, you give them continuity of funding, you turn that program manager loose and you say: "If you spend more than 10% of your time on other than managing that program, you'll miss." We do just the opposing. We ripple around with the funding so that they don't know what's happening. For example, if Congress suddenly decides to spend $100 million on drug interdiction, they don't appropriate the money. We have to go back to every program and say: "So much of it is your share, cut your program back by that amount." We then say: "Because we don't really trust you within DOD and Congress, we want you to spend all this time briefing all these people so they'll have an idea of what's going on."

In other words, you become the advocate for the program. I met with a large number of program managers for two days. Every one had the same complaint -- they spend over 80% of their time briefing people and less than 20% of their time managing their program. We have to fix that.

Ladies and gentlemen, what we need are good people in government. And we aren't getting them with what we're setting up in terms of our regulations, our laws, and our measures of investigation and audit, checks and everything else.

Questions and Answers

Q. The bureaucrats and DOD have attempted to take what we've done here -- voluntary self-governance -- and mandate it. What is your reaction to that? We're all opposed to it.

A. Well it's better that they mandate what you developed than that they mandate something that they developed themselves, I'll say that.

I won't name names, but the President got a letter just the other day from a couple of Congressmen who stated that this is the way that they've got to reorganize the Pentagon. And ultimately as it trickles on through I got a copy of it. And the day before yesterday I got a call from one of them who said: "Say, what did you think of the letter I sent?" And I said: "What letter?" But I had it. He said: "Well I want to make sure because I want you to come up on the Hill and testify next week." And I said: "Well I'd be very pleased to."

The next morning, sure enough, the Washington Post had the full letter. So anything I might do to change the management structure at DOD is in accordance with that letter. I'm sure you'll understand it.

I think it's to some advantage that we do work hand in glove. And this is what's happening on Section 27. We're spending the next 60 days having all of our people at DOD work with people in industry to see if we can come to an accommodation of definitions and guidelines that still living to the law are palatable and are something that we can work together on. And so it's important that they do that. But if you're implying that they just take your ideas and they're voluntary and then make them mandatory then I'd be dead against it.

Q. Mr. Secretary, I'd be interested in knowing how you anticipate dividing responsibilities that you'll exercise with respect to acquisition and the work that the Under Secretary of Defense for Acquisition, when appointed, will conduct?

A. Well, that's a serious question and one I've been asked by Congress. They asked me by telling me the answer -- and it differed from what I thought. That was in the hearings for my confirmation. It's very simple. The Under Secretary for

Acquisition will have the responsibility for determining, overseeing, and making sure that everyone does ... how we buy things. That's his full responsibility. He or she will chair the Defense Acquisition Board. I would not attend the Acquisition Board. But I will chair, as Deputy Secretary, the Defense Planning and Resources Board, which is similar to industry in that the Defense Acquisition Board is like the Executive Committee and the Defense Resources Board is like the Finance Committee because it's where they come for funding.

The conflict is really between the Defense Acquisition Under Secretary and the Service Secretaries because the program management and those people are under the Service Secretaries' domain. But in a very clear way, the desires, the directions of the Under Secretary for Acquisition will prevail -- they must prevail. Otherwise he has a nothing job and I think everyone agrees to that. Albeit that it's like a matrix organization in which the resources for accomplishing acquisition will rest within the Service Secretaries' organizations.

Q. This is more of a recommendation and not a question. But I think one way that the government might improve is if you would require a certain educational level and background for the people that negotiate, award, and administer government contracts over a certain dollar level. As it stands right now, there is a very good upward mobility program in the government where people without college education and without business backgrounds are dealing with multi-million dollar programs. But I think that if they had a particular background it would help us all.

A. I agree with that one hundred percent. One of the problems that we face -- and it ties in with what I'm saying -- of needing good people. But wherever they are if they're intelligent people we need to see that they have the training, the experience, and the education where possible in order to improve the whole caliber of the acquisition people. And as you probably know, we are now completing a full management review with recommendations to the President. It is due the end of this month and without trying to tip our hands, that is one of the elements that we address. I think it's a very serious, thoughtful suggestion.

Q. Mr. Secretary, one of the major problems is the divided responsibility and shared authority between the program manager and the contracting officer which gives us the kind of "who the hell do we talk to" attitude. Are you all thinking of doing something about centralizing that authority?

A. Well there are two series of centralization issues that have to be addressed. One is that some of you have an AFPRO, some of you have a NAVPRO, some of you have an ARPRO, and some of you have DCAA and some of you have all of them. Number one, we need to consolidate that so that we're all living to the same guidelines. It'll be a crime to have a plant under an AFPRO in one community and another plant in a community near it that has a NAVPRO or some other organizations. So I think that consolidation of effort, that standardization of requirements is absolutely essential.

Number two, the concern to me, and I appreciate what you're saying. The concern to me is the confrontational atmosphere that has evolved because so much of our audits have become geared to looking for corruption. That's the romantic ... that's the glamorous stuff to see if you can get a CEO guilty of something or some such thing and so much of that is directed towards that and it's not as romantic to be in there settling fair labor rates or fair burden rates and making sure that each company is treated properly and that it's a fair standard of cost or fair cost basis between the government and the company. And that's where we have to put our emphasis and not on the other. And that's only going to happen if we put the emphasis in the right area and don't assume that everyone's dishonest. I think that's the important thing. I look at the Program Manager as responsible for the entire program, including cost. And the Audit Agency ought to be an arm of providing input to him. And I think that's extremely important.

Q. Mr. Secretary. What progress have you made in getting your new team into place?

A. I think we're making progress. You know we went through a very abortive start in the DOD with the Tower nomination which consumed about the first two months. And then Dick Cheney came on board. And I might add I think he's going to be just tremendous, maybe one of the greatest Secretaries of Defense we've ever had. He's a great person, he's low key, but he's very firm, a quick learner, and he's a joy to work with so I'm pleased with that. We're making great progress now. We just had confirmed last week the new Secretary of the Navy, the new Secretary of the Air Force. We have a number of the Under Secretary and Assistant Secretary positions filled. But it goes slowly as you know and that may have prompted the question. The first thing you have to do is prove that you're in desperate need of a job -- you don't have any finances. So you have to fill out about a 15 or 20 page financial summary. Then you have to prove that you're absolutely perfect. And you go and make a list of every place you have lived since you were 18 years of age. And I'll tell you when you get to be 64 that's a hell of a lot of places. And people you knew there. And then you have to list every job that you've had since 18. And people that you knew there, who your supervisor was. And then you go through a series of what they call "serious questions." You know when I first went in the form said "have you smoked marijuana in the last five years?" And a pencil had been written through it and it said "ever?" And you go through all of this and then the FBI makes its checks and if you haven't had any kind of special access clearance in the last three months that takes anywhere from three to four weeks. It then goes to the Senate, and they schedule a hearing and you have a hearing. It then goes to the full Senate for confirmation. So the fastest you can get through is about 5 weeks right now. And it tends to get bound up. I know how to stop a nomination cold. That is let the person go and have his hearing before the Senate Armed Services Committee and just as they're about to vote, put in a telephone call saying "You know, I know someone who overheard something in a bar that Charlie Brown was in there drunk last week." And the whole gears come to a halt. Now they don't investigate so they go back to the FBI for the investigation. And I'm deadly serious. This has happened many times and it's a long process. We are making progress now, Judge, much progress.

Conclusion

Let me just say that someone said that if you stay there a period of time, whether it's four months or four years or forty years (and I guarantee you it isn't going to be forty -- it probably isn't going to be four months) what do you have to accomplish? How can you judge whether you've done any good or not? And I'll tell you very clearly. If at the end of the time I'm there, we can say that we have a defense industry that is damn proud to be working for DOD and that they indeed are providing world class qualities to the Armed Forces of our country, which are the best in the world, if they are happy to be part of it and Congress and DOD say: "You known, what a fortunate thing it is that we have this high-integrity, quality-producing industry" and even say it, then I'll consider my tenure has been a success.

Thanks very much for inviting me.

Mr. MENAKER. It might be helpful to just state for a second what led to these initiatives. It started back in 1986 when the Packard Commission report was about to be issued. David Packard made a challenge to industry when he asked why industry cannot develop on their own a set of initiatives that would impose upon them some self-governance requirements. With that, a group of 18 CEOs met in New York in June 1986 and developed what is now called the Defense Industry Initiatives.

Since that point in time, since 1986, there are now 48 companies that have participated and have become signatories to the Initiatives and are active participants in this initiative process.

What they decided in 1986, and what we have committed to do ever since, has been to sign up to the six principles of the Defense Industry Initiatives. One of those principles requires that a company establish a written code of ethics and standards of conduct that sets the standards that a company expects its employees to adhere to.

Signatory companies agree to distribute these codes to all employees in their defense-related business. They agree to orient new employees to these codes. They agree to provide significant training programs to their employees with regard to their codes of ethics and standards of conduct. They agree to install "hot lines." They agree to provide ombudsman services to their employees. And they agree to provide employees with an opportunity to make complaints and to make allegations through these hot lines that will get a response and that will not subject employees to retribution—a very important element to these initiatives—and that will hopefully get some result in responding to complaints and allegations that might change the compliance process of the corporation.

In addition to that, they commit to participation in the Best Practices Forums, which is a meeting that takes place on an annual basis—the last meeting was in Chicago only a week ago—where all 48 companies get together. We had over 200 individuals at that meeting. A lot of companies that were not represented in the initiatives also attended. We put on programs designed to allow each of the companies to understand what other companies are doing in this area.

The objective of the Best Practices Forum is to communicate between companies so that companies can perfect their programs, can learn from each other, and can implement those programs on the most positive basis possible.

Finally, the principles required the signatory companies to agree to a public accountability process. The public accountability process is a very complex process. I think it is the most complex part of these initiatives.

What it says is that companies will report annually on a number of questions that are attached to the Initiatives. There are 20 questions such as, "Does your company have a Code of Ethics?" "Do you train your employees?" and "Do your supervisors have to adhere to the Code and are they measured based upon their adherence to the Code of Ethics?"

The company supplies its response to an independent, in most cases outside, auditor of that company. The auditors then examine the company to determine whether in fact their response is correct. Once the examination is complete, all the auditors will submit their response to an external independent body that makes the annual report.

One other thing that companies do with regard to these Initiatives is that they commit to develop a procedure for voluntary disclosure. That procedure is designed for companies to consider and to determine whether or not they will disclose possible wrongdoing which they themselves uncover during the process of their self-assessment usually through an internal audit process.

I can tell you that in Chicago this year at our Best Practices Forum we had speakers such as the Deputy Secretary of Defense, the Hon. Donald Atwood; Griffin Bell, the former Attorney General and Vice-Chairman of the President's Committee on Ethics Law Reform; and Jim Burke who is the former CEO of Johnson & Johnson and an expert on company, ethics.

We had an extensive workshop program where we broke the organization into a number of smaller workshops and studied issues such as training, codes of ethics, participation by the signatory companies, how to add to the list of signatory companies, and questions like that.

I think that the level of energy that was displayed at that meeting in Chicago was very impressive and I think it has indicated, at least to us, that the DII process is in fact working.

There are a number of misconceptions that exist in the DII, and I would like to cover them very quickly.

One of them is what the Initiative seeks to achieve, what is its goal? I would like to state for the record that our goal is to encourage defense contractors to implement sound self-governance programs. Our goal is to communicate with our employees that which it is that the companies really want them to do. That is to do things right.

So, the goal of the Initiative is to develop codes and standards and to develop training programs that can be communicated to employees on a regular basis, on an annual basis, so that employees know exactly where they stand with their companies and know what is expected of them.

Second, there is a question as to whether the Initiatives can guarantee perfect compliance with procurement rules and regulations. That has come up on a number of occasions. There is no way that we can do that. I think that no matter how energetically we implement the Initiatives, no matter how we try to guard against possible wrongdoing by corporate employees, there are still going to be employees from time to time who will do things wrong, and they do it for a variety of reasons, not all of which I think we can fully understand.

The key to what it is we are trying to do is to provide these training programs to employees so that we can at least clearly communicate to the employees what it is that is expected of them. Then, if there is wrongdoing that is committed and disclosures are made with regard to that wrongdoing, at least the problem surfaces quickly, corrective action can be taken quickly, restitution is made quickly, and then you design processes within your system to make sure that those things do not recur.

I think that is a very positive step and it is something that the Initiatives are very strong on.

Another question that has arisen is what does self-governance mean? That is very tough to define. We have looked at a variety of definitions and have not really come up with one that I think would satisfy everyone. In a way that is probably good.

The process of self-governance or self-assessment can take on many forms. The role of the Defense Industry Initiative itself is not a self-governance process. It is not the complete process. It is only one element to that process; there are many others.

Total quality management is a process of self-governance. Internal audit functions are a process of self-governance. You have technical audits and environmental audits that take place in companies today that are also part of this self-assessment process.

The Initiatives do not pretend to be an all-encompassing self-governance process. They do lay the cornerstone, however, for one of the most important elements in this self-governance process, and that is the creation of codes of ethics, and the training and the implementation of those programs, as I described them.

The question keeps coming up: Why are there not more signatories? I think there are a couple of reasons for that. One is the public accountability process itself, I believe, inhibits some companies from wanting to participate as a signatory company. It is an expensive process. Most companies spend in the neighborhood of $50,000 to $100,000 a year on their auditors alone just to perform the audit examination. That is in addition to the training costs and in addition to the internal audit cost that takes place, which significantly can raise a corporation's overhead. But overall, we would argue that the cost is minimal compared to the benefit that can be achieved.

What we have to do is to communicate more thoroughly to companies that are not yet in this program that the cost is well worth the effort. We have a program ourselves that is designed to do that.

We are also looking at perhaps a second tier of participation in the DII that would allow smaller companies to participate without having to go through the public accountability expense where we might ourselves examine how they are doing and provide them with the kind of input and insight that they need to develop their programs.

Mr. Lewis discussed this, and I think it is important that we discuss it. Can you mandate ethics? It is a question that we have commented on to the DOD.

I agree with Mr. Lewis. You cannot do that. I just don't think that it works. You cannot put a ceiling on ethical responsibility, and that is what would happen if there are mandated ethics programs in the defense industry.

I think that innovation and competitive challenge would be removed. I think that we would not be able to gain the benefit that we currently gain from the exchange of information that takes place between these companies, and I think it would be a step backwards in terms of where we have come from.

Finally, if I may, I would just comment that the Initiatives are not complicated. The Initiative effort is designed to achieve some very important objectives. I think that in the past 3 years we have undertaken this effort, based upon the discussions that I have had and many of my counterparts have had with our fellow participants in this program; we are very comfortable and satisfied with its success.

We are not going to sit back and just say we have done our job, however. We intend to continue this process, to continue to discuss public accountability, and to continue to share with as many people that will listen the accomplishments that we have made to date.

The one thing I would urge your committee and you, sir, is that we get strong support from you in this area. I think the more commitment and support we get from the Congress and from the DOD and other executive agencies the more successful this program can be.

That concludes my comments.

[The prepared statement of Mr. Menaker follows:]

Statement of
Frank H. Menaker, Jr.
Chairman, Working Group
Defense Industry Initiative on Business Ethics and Conduct

My name is Frank Menaker. I am the Vice President and General Counsel of the Martin Marietta Corporation, and serve as Chairman of the Working Group of the Defense Industry Initiative (DII) on Business Ethics and Conduct, on whose behalf I am appearing today. I very much appreciate the opportunity to appear this morning and to be able to discuss with the Subcommittee the background and activities of the Initiative. It is also my desire to try to clarify several apparent misconceptions about the Initiative which seem to have arisen in the course of recent hearings in the Congress as well as in sessions of the Defense Advisory Panel on Government Industry Relations.

The Defense Industry Initiative was created in June 1986 as an outgrowth of the work of the Packard Commission. Under this Initiative, companies have voluntarily subscribed to a series of principles intended to promote the highest standards of ethical conduct in the industry. The basic Initiative document, which I would ask you to include in the record of this hearing, appeared as an Appendix to the Packard Commission report. It contains six guiding principles for defense contractor conduct.

Under the Initiative's principles, each signatory company has agreed to do several things. Each company agrees to establish a written code of conduct that sets the standards the company expects of its employees. Signatory companies agree to distribute this code to all employees involved with government contracting. Each company agrees to orient new employees with respect to the content of the code, develop and implement training programs on the code, install an internal hotline or ombudsman to permit employees to report violations of the code outside normal supervisory chains, participate in annual Best Practices Forums to learn what others have done in this area, and have a procedure for making voluntary disclosures to the government.

In addition to establishing these internal programs, signatories to the Initiative have agreed to be publicly accountable for the extent of their compliance with the principles. The public accountability process, which requires each company to complete a twenty item questionnaire, is designed to determine if the company has met its obligations under the Initiative's principles. Each company submits its responses to the questionnaire to an independent organization, usually the company's independent auditors. The auditors examine the questionnaire and responses in light of certain established guidelines developed by the American Institute of Certified Public Accountants, and then issue an opinion on the accuracy of the questionnaire. The questionnaires, together with the auditor's opinions, are forwarded to an external independent body. The external independent body then compiles the questionnaires and issues a public report. The 1988 report, which I would also ask to be included in the record of this hearing, demonstrates clearly that all signatories are doing what they committed to do.

There are presently 47 signatories to the Defense Industry Initiative. This includes all of the ten largest defense contractors and 21 of the 25 largest. The signatory companies represent more than 52 percent of the dollars committed through DoD prime contract actions.

Your hearing today is especially timely since we just held the fourth annual Best Practices Forum of the Initiative last week in Chicago. Representatives of all 47 signatory companies attended, as well as representatives of other companies considering becoming participants. I would ask that a copy of the program for the Forum be included in the record of this hearing. We were most pleased to have as speakers at our meetings the Honorable Donald Atwood, Deputy Secretary of Defense; the Honorable Griffin Bell, former Attorney General and Vice Chairman of the President's Commission on Ethics Law Reform; James Burke, former CEO of Johnson & Johnson and an authority on corporate ethics; and other senior government officials and defense industry leaders. A highlight of our session was a series of small group workshops. I would also ask that a memorandum summarizing the workshop assignments be included in the record of this hearing.

CLARIFYING MISCONCEPTIONS

With that as background, I would like to try to clarify several matters that have arisen in the course of hearings that Congress has held and in general discussion. Each clarification is phrased as an answer to a question.

1. What does the Initiative seek to achieve?

The Initiative is an effort to encourage defense contractors to implement sound self-governance programs on behalf of their employees. A public undertaking that defense contractors subscribe to the principles is also assured. The leadership of the Defense Industry Initiative believes that such principles are the cornerstone of sound management practices. In addition, by publicly subscribing to these principles, it may be possible for the industry to restore public confidence and trust in the industry.

2. Does this Initiative guarantee perfect compliance with procurement laws, regulations, and practices?

One frustration those of us active in this Initiative have faced is the sense that you and others perceive that any continuing problems in defense procurement are an indication that this Initiative has failed. That is an unfair conclusion for several reasons. First, no Initiative of this type, no matter how energetically implemented, will fully guard against the actions of a corporate employee who compromises the procurement process. We must expect that, as in all walks of life, there are those individuals who will commit illegal acts for a variety of reasons, not all of which can be fully anticipated or understood. What companies who sign up to the Initiative hope to accomplish is that through comprehensive training programs and education, employees will clearly understand that the company does not expect them to do the wrong thing. Initiative companies, and many other defense contractors, are training their employees to do the right thing, and providing employees with an outlet for complaint when they perceive others who are possibly committing wrongdoing.

Second, government contracting laws, regulations, and procedures are exceedingly complex and often require that judgment be applied. Inevitably there will be cases of honest disagreement between the government and its contractors in any such system. Today these cases take on a more serious tone. For if a contractor's good faith judgment is later the subject of disagreement, the contractor could be subjected to criminal prosecution. The complexity of the process has begun to deter individuals from decision-making or from a desire to even participate in the process.

Third, because there are so many areas of possible error for a government contractor, we readily admit that we may not yet have placed adequate emphasis on every conceivable area of risk for the government and our companies. Many of us believe that operation "Ill Wind" resulted primarily because we did not fully understand that the areas of competitive information gathering and control of marketing consultants were areas that required stronger standards and far more attention than has been provided. The compromise to the procurement process that has apparently taken place must be eliminated. I believe the Departments of Justice and Defense are doing an excellent job of eliminating such compromise, deterring these events from occurring again, and forcing contractors into taking important corrective steps. A competition that is fixed is no competition at all. It doesn't take a genius or a strong competitor to win a wired competition. The government's effort to eliminate such abuse is to be applauded.

Fourth, many of the problems which surface on the front page of our newspapers pre-date the Defense Industry Initiative. Many contracts from the early 1980s are still being audited, and there may be further problems that will arise from the period before this Initiative began. That should not and will not deter the Initiative effort.

For all of these reasons, we would urge you to provide your full support to this effort. Gary Edwards, the Executive Director of the widely-respected Ethics Resource Center, has often commented that, in his view, the defense industry has taken broader steps than any other industry as a whole to voluntarily promote sound business practices. It is my understanding that when the securities industry considered a program like ours in the wake of the insider trading scandals, they were unable to generate any substantial interest in such an effort. As our principal customer, the Defense Department, has come to increasingly understand this Initiative; it has become highly supportive and complimentary of it.

3. What does corporate self-governance mean?

Much of the emphasis on the Defense Industry Initiative effort has been on the question of corporate self-governance. There is no general agreement on the meaning of this term. Some people refer to self-governance as "self-policing."

Because both terms are used in discussing the DII effort, some have mistakenly concluded that the DII is an attempt to replace government audit and oversight activities with industry efforts alone. That is clearly not the case. The purpose of the Initiative is to promote a high level of contract compliance by defense contractors, and to encourage ethically sensitive decisions if ethical dilemmas arise. The Initiative is a supplement to government oversight, not a replacement for it.

4. Why aren't there more signatories to the Initiative?

There has been an ongoing effort to increase participation in the Initiative. The fact that there are 47 signatory companies to this Initiative may lead to incorrect conclusions. As I noted earlier, these 47 companies include all of the ten largest defense contractors, and 21 of the 25 largest. Many other companies that have not chosen to participate in the Initiative have nevertheless put ethics programs in place. Those companies apparently prefer not to participate in certain Initiative requirements, such as the annual audit, because of the complexity and cost involved. They are no less responsive, however, to the need for meaningful compliance programs. We will nevertheless continue our efforts to enlarge the participation.

5. Can you mandate ethics?

This, of course, is an important question. There has been some discussion about the possibility of mandating that all defense contractors have ethics programs. In fact, the Department of Defense issued a rule in September 1987 which makes it the policy of the Department that each contractor within a single DoD contract of $5,000,000 or more have such a program. Generally, it has been our view that mandating these programs is not a good idea. We believe that when a program is mandated, it promotes a checklist type of mentality. With legislation or regulation, a ceiling is placed on ethical responsibility. Innovation and competitive challenge are removed. What programs like this need in order to succeed is energetic, sincere, continuing support from the Congress and Executive Departments. What the Initiative is trying to do is to send a message in the strongest possible terms to defense contractor employees that its top management will not tolerate anything other than the most ethical conduct at any level. The message of this Initiative, quite simply, is that no matter how severe business pressures may be, employees are never expected or permitted to cheat and those employees that perceive or witness such improper conduct are provided an important outlet through ombudsmen and hotlines, without fear of retribution, to make complaints.

* * * *

I should like to make a few final points. The Defense Industry Initiative is one of the bright spots with respect to the evolving relationship between DoD and its contractors. I wish that each of you could have attended our recent Best Practices Forum in Chicago. You would have seen the genuine enthusiasm and commitment of those who were there to what this Initiative is trying to do.

I have been greatly concerned over the last months that the Initiative is not well understood. I have been concerned that the purposes of the Initiative have become confused with some ill-defined concept of corporate self-governance, and that the Initiative is therefore perceived to promise more than it does or can promise.

The Initiative is not complicated in either its intent or its structure. It is an effort to ensure that people throughout the defense industry know what is expected of them and that they perform to what is expected of them. I think it is having a substantial amount of success in doing those things. Your support of and encouragement for what we are trying to accomplish would help greatly.

Senator BINGAMAN. Thank you, Mr. Menaker.

Mr. Odeen, go right ahead.

STATEMENT OF PHILIP ODEEN, MANAGING PARTNER OF COOPERS & LYBRAND AND CHAIRMAN OF THE BOARD OF PROFESSIONAL SERVICES COUNCIL

Mr. ODEEN. Thank you, Mr. Chairman. I am appearing here today on behalf of the Professional Services Council, and I serve as the Chairman of the Board of the PSC. In addition, I am the managing partner of the Washington office consulting operation for Coopers & Lybrand, a "big eight" accounting firm.

PSC represents over 100 companies in the high technical content area of the services business, as well as a number of independent trade associations. Our members include research and development firms, independent laboratories, architect and engineering firms, information technology companies, as well as the "big eight" accounting firms.

We are here today to express our concern over the methods used by the Federal Government to procure professional and technical services. We believe the present procedures and policies simply do not buy good high-quality services for the Government. In short, the Government is not getting its money's worth.

In addition, we are concerned about the way the present procedures and policies are working, and their impact on our industry and our ability to attract the very best and brightest people to our organizations.

Our members perform a wide range of services for the Government, ranging from AIDS research, to the flight testing of safety equipment, to the design of software to target missile systems on Navy ships. In all cases there are four common ingredients—very high technical content, technical background, professional education and solid experience. Unfortunately, the Government has yet to determine how to purchase these types of services in a cost-efficient manner.

In my testimony today, Mr. Chairman, I would like to suggest several specific actions which we believe should be taken to improve the way the Government buys professional services.

Before I do that, however, let me briefly discuss the problems as we see them. Then I will turn to the solutions that we would like to offer for your consideration.

THE PROBLEMS

Our first concern is the inbalance between cost and quality. Since the advent of the Competition in Contracting Act there has been a strong tendency on the part of the Government contracting community to buy services the easiest way, using the common denominator of cost. This is the easy way to discriminate, rather than evaluating quality and the best value, as they should.

You hear considerable talk about "best value." That is, buying high, or the highest available quality at a reasonable cost. The reality is that the consideration of quality is seriously lacking in most procurements of our type of services. Instead, the system buys on the basis of minimally; technically-acceptable quality and low cost.

Our second concern relates to cost realism. Cost realism is the process the Government uses to ensure that the bids that are submitted are, in fact, realistic and will provide the type and quality services that, in fact, are desired.

The pressure toward awarding to the lowest-priced bidder has caused many firms to resort to various kinds of gimmicks to make their bids appear to be the lowest price. This includes such practices as mandatory uncompensated overtime and ways to weight the hours to make the overall cost seem lower. In many cases the results are misleading, and tend to drive the focus more to cost and less to quality.

We are also concerned about the impact of lowest price awards on the innovation and creativity of our industry. A recent CSIS study, which I believe has been briefed to this subcommittee, describes the exodus of firms away from doing business for the Government. The study indicated that during the 1980s there has been a two-thirds shrinkage of firms willing to do business with the Government.

This certainly is true in the service industry, as well. In particular, firms that have a substantial commercial business as well as a government business, are turning their time, attention and priorities to the commercial area. In many cases this means that the firms we want, to bring fresh ideas and approaches, are turning to other markets. We also see a drop in interest on the part of young professionals to work on government contracts. These developments are certainly not in the interest of the Government and need to be addressed.

Another of our concerns is the longer procurement cycle. The current environment has added months to the time it takes to procure professional services. This is due to the range of new regulations and the increasing complexity of the overall procurement process. Multiple best and final offers also contribute. Of course, time has its price, and we think the Government and the Nation is paying as a result.

Another concern is the "bid protest syndrome." There has been a rapid increase in the number of protests on bids in the professional services area in recent years, in particular in the data processing area. From 1985 to 1988, the number of cases filed with GSA increased about 150 percent. In fact, more than 200 bid protests were filed with GSA during this period.

Finally, we are concerned about the professionalism of the Government procurement work force, an issue that this subcommittee has addressed many times over the years.

One of the unique aspects of buying services is that a lot of judgment is involved. There are very tough choices to be made in determining the quality that is needed and defining the specifications in a way that the Government will get the quality it needs at a realistic price. This requires judgment, it requires experience, it requires talent.

This is an area that simply has not attracted enough attention on the part of the Government. The problem, of course, has been highlighted by the Packard Commission, the Volcker Commission and writings of experts such as Jacques Gansler.

THE SOLUTIONS

Let me now turn briefly to the solutions that we suggest you consider to remedy the problems that I have raised. I will only highlight a few of the more significant fixes, and obviously we would be happy to work with your staff to elaborate on them, if that would be helpful.

Our first recommendation is a much greater emphasis on quality. It is essential that in Government procurement actions for high technical content services that it be made very clear and very explicit in both the RFP and in the subsequent contract what the quality performance needs are. This has to be specified very clearly and very explicitly.

To this end, we believe the Competition in Contracting Act (CICA) should be amended to underscore more clearly the importance of quality when procuring professional and technical services. The contracting officer should be required to set forth in clear and concise language in all solicitations in contracts the quality requirements of the Government.

We also believe that amendments to the section of CICA regarding Best and Final Offers (BAFO's) should be amended. In particular, we recommend that the contracting officer be permitted to award a contract without further discussion or a BAFO in cases where it is clear that the Government gets the best value from a contract. The current terminology essentially requires the contracting officer to have further discussions unless he awards the contract to the lowest bidder. In cases where there is a high technical content, we believe he should be empowered to make a selection on the basis of his judgment, without holding discussions, that the quality requirements of the Government are such that a higher cost and higher quality bidder should be awarded the contract.

This would have a number of advantages, including streamlining the acquisition process and giving additional authority to the contracting officer. It would also help reduce the bid and proposal costs involved in going back for a BAFO, costs that are passed on to the Government in cost type contracts.

This change would reduce the likelihood of gaming by forcing the offerors to come in with their best price in the initial bid rather than holding back to the normal BAFO.

Finally, we think it would facilitate the procurement of high quality technical services which we are convinced is in the Government's interest as well as in our industry's interest.

With respect to cost realism, we believe a number of things can be done. First, we think it is important that the Government maintain records of past cost performance by the contractors. Did the contractor, in fact, deliver what it said it would at the cost it proposed?

The contracting officers need data bases on such things as unit labor costs of critical skills and job categories so they know what they should expect to have to pay and not accept what in many cases are unrealistic prices.

The contracting officer should look at unsure departures from the norm in areas such as labor mix and situations where someone bids very low G&A or very low fringes, which may indicate a lack of realism in the cost proposal.

We also believe that past contractor performance should be considered by the contracting officer. He or she should talk to other contracting officers who have worked with the firm making the proposal to ensure they understand how well that firm performed on its past government contracts. Did it provide high-quality work? Did it deliver what was requested? Were the costs realistic, and so forth?

We also support various actions to improve the professionalism of the Government's procurement work force. In many cases, we find the educational background, training and experience of contracting officers is simply not adequate to address the challenges involved in buying high technical content services.

For example, we believe consideration should be given to requiring strong educational backgrounds for contracting officers at certain levels, an MBA or other advanced degrees would help prepare a person to make the kinds of judgments and decisions that are required. Within our procurement organizations, almost all of our people are well-trained, and we think the individuals representing the Government should be equally well-trained.

It is also necessary to provide contracting officers better training programs and for the Government to assign some of its better people to the procurement of services. The priority now tends to go to hardware procurement.

Finally, and importantly, we strongly support the kinds of legislation that you, Mr. Chairman, introduced last year to improve the civil service work force. We feel strongly that the Department of Defense and other agencies of the Government will not be able to attract and retain capable professional and technical people unless the civil service system is strengthened. The bills you proposed last year would go a long way to solve this problem and we strongly support them.

Finally, we recommend revisions to the Federal Acquisition Regulation (FAR), the so-called Part 37, which relates to the professional and technical services industry. It is currently obsolete; it only covers a very small portion of the services procured by the Government (less than 5%) and requires a major overhaul. To that end, we have developed draft language which we have provided to the Department of Defense, and we strongly recommend that they move forward to revise Part 37 of the FAR.

Mr. Chairman, I thank you for the chance to testify today, and I look forward to responding to your questions as well as to working with your staff on this most important issue.

[The prepared statement of Mr. Odeen follows:]

BY PHILIP A. ODEEN

STATEMENT OF THE PROFESSIONAL SERVICES COUNCIL (PSC) ON "ACQUISITION REFORM"

Mr. Chairman, I am Phil Odeen and I am pleased to appear on behalf of the Professional Services Council (PSC) before the Defense Industry and Technology Subcommittee of the Senate Armed Services Committee this morning to propose specific actions to improve the federal government's acquisition of professional and technical services. I serve as Chairman of the Board of PSC. In addition, I am managing partner of the Washington consulting office of Coopers & Lybrand, one of the "Big 8" international accounting firms.

PSC represents over one hundred companies and firms, as well as associations. PSC members include research and development firms, independent laboratories and test facilities, program analysis and evaluation companies, architect and engineering firms, systems integration and support activities, computer software development firms, and public accounting firms, among others.

PSC is here today to express our concern over the methods being used by the federal government to procure professional and technical services. We believe current policies and procedures lower the quality of services the government obtains from its limited procurement budget. These policies and procedures also negatively affect the people who still are willing to do business with the federal government. In our opinion, the recommended policy and procedural changes that we offer will allow the government to make the best use of its resources and the contractor community.

I. THE PROFESSIONAL AND TECHNICAL SERVICES INDUSTRY: THE NEED FOR DEFINITIONAL CLARITY

The information explosion and development of new technologies over the past twenty years have contributed to the exponential growth of the professional and technical services industry. It is estimated that our industry encompasses over 270,000 firms generating over $200 billion annually in revenue and employing approximately 3 million people.

Professional and technical services firms perform critical activities ranging from AIDs and cancer research and primary health-care in Third World nations, to safety testing of flight equipment and design of software programs, to target weapons aboard Navy ships. In these, and all areas of work performed by the professional and technical services industry, quality and technical excellence are of paramount significance.

PSC's member companies and firms provide a broad range of services such as pioneering new industries, improving the environment, training the public and private sector work forces, defending America, and providing health care, welfare and other human services. Whatever the service, these companies are distinguished by their high thought-content. Some specific examples of our industry's contributions follow:

- Several PSC member firms are deeply involved in the Navy's efforts to improve the effectiveness and to cut the costs of its shipyard, aircraft, and weapons maintenance activities.

- One PSC member has been awarded a contract to develop a cargo movement tracking and reporting system that will automate the Air Force's crisis mobility activities to improve the flow, availability, timeliness and interoperability of information with other systems.

- Another PSC member conducts design reviews of safety systems at nuclear power plants for the Nuclear Regulatory Commission.

- Yet another PSC member firm has performed research, with internal as well as government funding, that led to the development of a unique process that uses concentrated solar energy to destroy hazardous organic wastes in the soil with a minimal impact on the environment.

Unfortunately, the government has yet to determine how best to purchase these services in an effective manner. Policy directives and classification codes exist that begin to address the specific characteristics of the professional and technical services sector. But, despite the significance to the federal government of our industry's contributions, the government's descriptions of such services -- Federal Acquisition Regulation (FAR) Part 37, Service Contracting; OMB Circular A-120; SIC Code Major Group 87 -- constitute a "definitional quagmire," and provide little guidance on the procurement of professional and technical services. By creating incomplete, overlapping and fragmented definitions of our industry, the government complicates the gathering of information and hinders the development of sound procurement policies.

In response to a request from the Department of Defense (DoD) in 1987, PSC submitted proposed revisions to FAR Part 37 (See Appendix). The current FAR Part 37 only covers about 5% of the dollars spent for services. In an effort to address this problem as well as to provide definitional clarity, we offered DoD a clear definition of the scope of services and contracting activities which fit within the definition of professional and technical services contracting (See Appendix, pages 1-2).

While important in and of itself, this was much more than an exercise in improving definitions. The inclusion of a particular type of service within the professional and technical services category drives many important decisions, such as selection of contract type; derivation of source selection criteria/weighting factors; source selection evaluation procedures and criteria; and, profit objective determinations.

II. CURRENT PROBLEMS

The acquisition of professional and technical services is suffering from a progressive deterioration of the quality imperative in favor of the low bid. As in the case of acquisition and procurement policy generally, the problem is a complex one composed of multiple factors and does not lend itself to a single solution.

The deterioration of the quality imperative has several origins: 1) even though services have grown to be a substantial portion of federal procurement (estimates as high as $20 billion), they have not been recognized and accorded the policy, regulatory and process-discipline type attention which tends to be invested in hardware-based procurement; 2) the well-intended Competition in Contracting Act (CICA) frequently has caused an overload of the government procurement system, often making it convenient and relatively risk-free to decide too many competitions based on cost at the expense of quality; and, 3) the philosophical and professional orientation of the federal procurement work force is not at this time geared to rendering the type of subjective professional judgments needed to ensure proper recognition of the quality factor, where appropriate, in services procurements.

In short, procurement of professional and technical services has remained a "stepchild" in the universe of federal acquisition -- a situation which increasingly denies the government the type of technical and intellectual creativity, innovation and constructive energy that it deserves; discourages highly-talented people from entering the portion of the services industry serving the government; and, subtly "de-motivates" existing services firms to emphasize quality.

In today's testimony, I will suggest several specific actions which should be taken by DoD (and the rest of the government), which will improve materially the ultimate quality of professional and technical services provided to the government.

The sharp increase in competition during the last five years, while achieving a desirable policy goal, has given rise to six highly undesirable effects:

- Many procuring organizations are sacrificing quality to the "low bid;"

- Too many offers contain cost proposals which are potentially unrealistic -- meaning the work cannot be performed properly within the financial terms of the proposal;
- The procurement system discourages quality and innovation;
- The procurement process is lengthening;
- Bid protest activity has increased alarmingly; and,
- The procurement work force is being tasked to make complex decisions without the benefit of the proper organizational structure, education, training, procedures or incentives.

A. Quality vs. Cost

With the advent of CICA, the tendency of the government procurement community has become one of awarding contracts on the basis of the "easy discriminator" of cost rather than the more difficult "discriminator" of quality. There is considerable talk about the procurement of "Best Value," that is, buying high or the highest-available quality at a reasonable cost. But, the simple reality is that the consideration of quality is seriously lacking in most procurements of professional and technical services. The system today buys on the basis of minimally-, technically-acceptable, low cost.

Although the purchase of professional and technical services on a low-bid basis may provide illusory short-term savings, the long-term benefits and attendant savings which accrue from the procurement of quality services are lost. It often is the case that a $100,000 analysis, if well done, can save the government millions, if not tens of millions of dollars; an incredible return on investment, if wisely made. While cost always should be a factor in the evaluation process, strong emphasis should be given to ensuring that the government receives the quality it needs at a reasonable cost.

Another contributor to the current cost versus quality environment is that of "technical leveling" and/or "cost auctioning."

Technical leveling best can be thought of as "over-negotiating" by the agency to the point that so much discussion, negotiation and clarification occurs that several technical proposals -- if not all technical proposals, including those which virtually were unacceptable in the initial evaluation -- appear to be clustered in an acceptable range. Yet, the reality is that some of the bidders, in fact, are unable to deliver the quality needed by the government. Cost auctioning occurs in a similar manner -- when the repetitive discussions are about cost and pricing -- and brings about, intentionally or not, the submission by contractors of unrealistically low, final cost offers. A similar situation can be achieved by repeated requests for Best and Final Offers (BAFOs). The end result is that the stated evaluation criteria, which initially ranked technical/quality factors much higher than cost factors, are abandoned and the award determination is based solely on price.

These practices are unfair to the offerors who legitimately score higher through their own independent efforts. Equally important, they also are unfair to the government, since the result often is that the government selects a source which is unable to provide services effectively -- or on a "Best Value" basis -- as we described earlier.

B. Cost Realism

Cost realism is the process by which the Contracting Officer determines that contractor-proposed amounts are realistic for performance of the government's requirement. In the current "low is better" environment, this requirement for a determination of cost realism is, in fact, receiving little more than sporadic and superficial treatment. The situation regarding determination of cost realism is analogous to that of the "emperor's new clothes;" the government assures industry that it exists, but all evidence indicates otherwise.

For example, how can anyone claim that the widely-reported $7 per hour rate for a professional-level labor category contained in a recently awarded contract is realistic? Yet, the government made just such an award. It is our belief that an informed, substantive review of winning contractors' proposals performed by trained professional buyers is essential to the procurement of quality services and the preservation of the integrity of the procurement process.

The strong competitive environment created by CICA and the current overwhelming emphasis on lowest price has resulted in some contractors attempting to "game" the government's source evaluation process by submitting unrealistic cost proposals. Contractors have devised various "gimmicks," such as uncompensated overtime for professionals, and the bidding of unrealistically low labor rates to win awards. The above-cited $7 per hour, fully-loaded rate is an example of a rate which is so low that no contractor can hope to provide services, let alone quality services, at this price. The government's acceptance or even acquiescence in such practices has created a growing disincentive to propose the high level of quality services that the government really requires, and has created mistrust and hostility between the government and the majority of its contractors. This mistrust and hostility stems from the seller's frustration with his or her inability to provide the government's desired quality of services for the price required in order to win, and the government's belief that the seller is providing lower quality services than offered. The only answer is for the government to exercise its responsibility as an informed buyer and to no longer tolerate "gimmicks," such as uncompensated overtime or unrealistically low rates.

C. Loss of Quality, Innovation, and Creativity

The current procurement system, as it relates to professional and technical services, contains many disincentives to providing needed quality, innovation and creativity. These occur in direct and, often, subtle ways. Both the buyer and the seller face multiple impediments, and few clear incentives for the acquisition of quality services. Representative impediments include:

- Failure by the government to describe accurately the level of quality it believes is required to fulfill a given contract requirement competently.
- An all too pervasive low-bid mentality which makes it too risky for offerors to propose the type of talent (with its associated costs) needed to deliver quality, innovation and creativity. It also impacts profitability and increases risk.
- A widespread perception within the service industry that there is very high resistance to any form of unsolicited proposal involving services, other than pure research and development (R&D).
- A lack of discipline and consistency in considering past performance by contractors in situations requiring specialized and high-level professional talent.

This environment has the effect of deterring some firms (especially those with a significant commercial business base) from competing for government work. Indeed, a recent Center for Strategic and International Studies (CSIS) report states that the number of firms doing business with the government shrunk by two-thirds during the 1980's. We have no hard numbers to provide, but we are sure this pattern affects the services sector as well as the hardware sector. We also see a drop in interest by the best of our young professionals in working on government contracts. These developments are not, in our view, in the best interests of the nation, and must be addressed.

The foregoing list is by no means exhaustive. In short, there are many factors which militate against either the buyer or seller seeking to deliver exceptional degrees of quality, innovation and creativity.

D. Longer Procurement Cycle

The current procurement environment also has added time to the list of difficulties in procuring quality professional services. The acquisition cycle has continued to lengthen due to the growing number of regulations and the increasing complexity of the competitive procurement process. Multiple BAFOs also contribute to the length of the procurement cycle. Time has a price, and the inability of the system to react efficiently and reasonably is exacting a price that someday we will have to pay.

Another practice in the procurement process that is having unintended results relative to the length of the procurement cycle is that of "bundling" requirements into increasingly large procurement packages which cover more than one year's requirements. This has resulted in a tendency in the procurement of professional and technical services toward large task order level-of-effort (services by the hour) contracts spanning 1-5 years, with broad statements of work, and with the specific tasking to be issued at a later date. This methodology results in solicitations being issued which promote a low-cost mentality, since the easiest discriminator between offerors is the cost per hour. The competition becomes one of seeing who can provide the cheapest staff member who minimally meets the personnel qualifications of the Request for Proposals (RFP). Since there is no "real" statement of work, there is little room for innovative approaches or more efficient solutions to specific problems. A contractor derives little leverage and, in fact, often is penalized for providing exceptional people. Companies compete in this process not by attempting to increase quality, but by 1) attempting to seek the lowest-cost individuals who minimally meet the requirements of the solicitation; 2) assuming that the staff will work extra hours to complete items and to lower the hourly rate; and/or, 3) reducing personnel costs through substandard or zero employee benefits.

E. "Bid Protest Syndrome"

Federal contracting bid protest activity has increased alarmingly in the procurement of professional and technical services -- primarily in Automated Data Processing (ADP) - based systems and software development under the purview of the General Services Administration (GSA). Cases filed increased 150% between 1985 and 1988 to over 200 cases, according to GSA records.

Today, firms offering proposals on ADP-related opportunities can assume confidently that the majority of such procurements will result in a protest. The disruption, delay, and unproductive expenses to both the buyer and seller are getting greater each day. It is not unusual for a routine protest to cost a contractor $50,000 - $100,000 or more. It has become a cost of doing business, a cost which is passed on to the government.

Since industry does not trust the procurement system to be able to provide a fair and rational decision, the bid protest syndrome has become a "proxy" for the major flaws in services procurement.

F. Professionalism of the Government Procurement Work Force

A distinctive factor in the acquisition of professional and technical services is the unusual importance assigned to the exercise of professional judgment by government procurement personnel. They face a very difficult challenge in determining the level of quality required to define the government's requirements, and by selecting and ranking evaluation factors which will control source evaluation and selection. As noted earlier, the decisionmaking process for purchasing quality services is flawed in many ways. But, equally important, these taxing professional and technical service decisions often are made by government officials who lack the necessary qualifications and training.

This problem has received considerable attention in recent years. The importance of the acquisition work force has been recognized in virtually every recent major study of procurement reform. In 1986, the Packard Commission concluded:

> "DoD must be able to attract, retain, and motivate well qualified acquisition personnel... Federal regulations should establish business-related education and experience criteria for civilian contracting personnel, which will prove a basis for the professionalization of their career paths. Federal law should permit expanded opportunities for the education and training of all civilian acquisition personnel. This is necessary if DoD is to attract and retain the caliber of people necessary for a quality acquisition program."

Earlier this year, the Volcker Commission issued its report and comprehensive recommendations to rebuild the public service, including the need to "ensure that federal managers receive the added training they will need to perform effectively."

And, in a recently released book, Affording Defense, Jacques Gansler, a senior industry executive and faculty member of the JFK School of Government at Harvard, wrote the following about acquisition reform:

> "First, and clearly of highest priority, is enhancing the quality of acquisition personnel. Without high quality, experienced personnel running the acquisition system--from the political appointees on down--all the changes in the world are unlikely to result in success. There must be clear career paths, so that outstanding government people can get extensive acquisition experience and then continue to apply it as they move up through the acquisition world; and we must make every

effort to retain these people, not only within the government but within the field of acquisition."

III. PROPOSED SOLUTIONS

PSC has developed a number of specific proposals to improve the procurement of professional and technical services. While I will not go into the details of all of these proposals, we always are pleased to work with the appropriate officials to seek mutually beneficial improvements in the government's acquisition of services. I would like to take some time to discuss those we consider paramount. Most problems can be remedied by regulatory or administrative action. But, in two cases, we believe legislation is necessary.

A. The Quality Imperative

Professional and technical services procurements are unique in that the presence of firm specifications and objective acceptance criteria by which the government can measure performance tends to be the exception rather than the rule. In the absence of firm specifications and objective acceptance criteria, the measurement of quality becomes extremely difficult.

The acquisition of services requires a different approach than the acquisition of hardware. As stated in the Navy Competition Handbook (April 1989):

> "....With services, the government is buying expertise, knowledge and time.... The corporate management expertise and technical knowledge contained within a service's organization must be proportional to its policies, reputation, and commitment to professionalism and quality assurance. For this reason, and the fact that most service efforts are not 100% definable, it is typically preferable to use a best value selection criteria (sic). In this situation, greater emphasis can be placed upon the program management experience of the firm, along with the technical expertise of the people rather than just the cost. In the services environment the old axiom, 'you get what you pay for,' holds true. Management, technical ability, and cost are directly proportional. For service contracts, the government should not always limit itself to vendors who meet the minimum acceptable requirements but should strive for those service vendors who exceed these standards in search of excellence...."

The Contracting Officer and the Contracting Officer's Technical Representative (COTR) should consider carefully the nature of the services to be procured and structure all aspects of the RFP and resultant contract so as to require a level of quality commensurate with the requirement. A clear statement of the required level of quality should be mandatory in all solicitations and contracts, and the government should insist upon receiving services of this quality.

B. Amendments To CICA

Accordingly, CICA should be amended to underscore even more clearly the importance of quality in procuring professional and technical services. The Contracting Officer should be required to set forth in clear and concise language in all solicitations and contracts the quality requirements of the government.

Since the enactment of CICA, the prevailing methodology within DoD for the evaluation of professional and technical services procurements has been based on a "technically-acceptable, low-bid" concept. In the past six months, the use of this evaluation approach slowly has begun to give way to the increased use of a "Best Value" approach. In this same time frame, the use of the BAFO, particularly multiple BAFO's, has come under increased scrutiny by DoD.

The combination of these two events has given rise to a review of the CICA provision, which states that contract awards without discussions only will be made "when it can be clearly demonstrated... that acceptance of an initial proposal without discussions would result in the lowest overall cost to the United States." While the term "lowest overall cost" is not synonymous with "lowest contract price," the current environment militates against any other interpretation. Even the amendment already made to CICA relative to consideration of quality has not been enough to overcome the "lowest contract price" syndrome.

PSC strongly advocates that this provision of CICA be clarified to provide specific authority for contract award without discussions to an offeror whose proposal is most advantageous to the government -- price and other factors considered. A subsequent revision to the FAR also would be required to implement the statutory amendment. It should be noted that these changes neither would prevent the government from awarding a contract without discussions relative to a proposal which offers the "lowest overall cost," nor would prevent the government from holding discussions where warranted.

PSC believes that the following benefits would result from such a statutory clarification:

- Acquisition Streamlining - The broader ability to award contracts based on initial offers would serve to shorten the procurement cycle, and should foster specific and concise statements of work and requirements descriptions. This should reduce the likelihood for bid protests.

- Contracting Officer Authority - Use of the "Best Value" evaluation and selection process would strengthen the Contracting Officer's role in source selection by renewing a decisionmaking process that involves an informed judgment of what represents the "Best Value" to the government, rather than simply selecting the lowest-priced offeror.

- Cost Reductions - Awards based on initial offers would reduce contractor costs for bid and proposal expenses. While some could argue that contract price reductions currently being realized from lengthy discussions and BAFOs may not be realized when an award is made on initial proposals, such savings are past the point of diminishing returns since contractors will tend to offer their best price in their first offers -- and, the government's overall savings from shorter procurement cycles will result in more savings.

- Reduced Gaming - Awards based on initial offers should reduce "gaming" of initial cost proposals and, as noted above, should encourage contractors to present their best and most realistic and reasonable prices upon first submission of proposals, since there will be no guarantee of a "second bite at the apple." In addition, the potential and incentive for wrongful disclosure of sensitive procurement information should be reduced with the absence of discussions or possibly multiple BAFO rounds. Finally, this approach may have the positive side effects of discouraging technical leveling and cost auctioning, while improving performance, quality and efficiency.

- Enhanced Quality - The ability to select other than the lowest-price offeror based on initial proposals provides the government a choice, in that the contract award can be made to an offeror who provides higher technical value, provided that the price offered is considered fair and reasonable.

C. Cost Realism

With rare exceptions, the federal government does not have in place the policy framework, operating procedures and culture necessary to perform cost realism evaluations in a systematic and vigorous manner. For the most part, it is done in an ad hoc, random, and often superficial manner.

Cost realism evaluation is performed routinely in the private sector in the course of evaluating offers to provide goods and services; it requires technical competence and process discipline.

Cost realism in services contracting (and in most R&D contracting) can be improved substantially by developing and implementing policy and procedures which focus on:

- Maintaining records of past cost performance by contractors (did they deliver what they proposed?).

- Maintaining market data bases such as:
    - Unit labor cost for critical skill/job categories.
    - Average total ("fully-loaded") cost per person year.

- Identifying unusual departures from reasonable norms (e.g., labor mix, labor rates).

- Understanding the real impact of unusual devices to reduce costs, such as mandatory uncompensated overtime, consultant or intermittent labor, and "free labor."

- Questioning unusual modifications to financial models, such as low or no fee, low G&A, and low fringes.

Establishing a requirement to perform a substantive cost analysis and to evaluate all proposals based on a 40-hour work week/2080 hour year is the only way to guard against "sharp bidding practices" and to preserve the integrity of the procurement process.

D. Consideration of Past Performance

Government-developed past performance data is one of the strongest indicators to be considered during the source selection process to predict future contractor performance. An effective method for obtaining this data is through personal interviews between a source evaluation board member and a previous Contracting Officer or COTR of similar contracts that the offeror under evaluation has completed. Therefore, it should be required that solicitations request related experience on the most recent and relevant programs, and require the name, address and telephone number of the Contracting Officer and the COTR for each program. This allows a personal interview and an in-house verification of the offeror's past performance.

E. Professionalism of the Government Procurement Work Force

As mentioned earlier, a high degree of professional judgment is required in the procurement of professional and technical services. This means that procurement professionals must be experienced and well-trained in 1) the differences between services and hardware acquisition; and, 2) the concept and methodology of determining "Best Value." Clear and consistent guidelines and justifications for decisions are needed to help avoid bid protests that consume vast amounts of time and effort on the part of both government and industry.

Finally, the commitment and support of top management to the concept of "Best Value" needs to be communicated and reinforced at all levels of the procurement work force.

To enhance the professionalism of the federal procurement work force, PSC recommends that high educational standards be established. All procurement professionals at a specified level of responsibility should possess an MBA or graduate degree in a relevant procurement discipline or concentration, as do their counterparts in private industry. This may require a legislative proposal to phase in an MBA or graduate degree requirement in stages, but we believe it is important to start now. We also support legislative efforts such as the Bingaman bill introduced last Congress, legislation that attempts to address this issue.

Government agencies also must give at least an equal priority in the assignment of qualified professionals for the procurement of services, as it does for hardware.

In addition, we recommend that the authority of procurement officials who must make these decisions be enhanced. The procurement of professional and technical services requires the exercise of a great deal of judgment. Unfortunately, there is little incentive in today's environment for such judgment. It is safer to take the route of awarding to the "low bidder." Any other decision implies some level of "risk" without incentive, recognition, or management support to officials involved.

F. FAR 37 Reform

As noted earlier, the current FAR only covers about 5% of the dollars spent for services. Accordingly, the FAR should be amended -- specifically, FAR Part 37 -- to provide adequate recognition of the professional and technical services industry, which generates over $200 billion annually in revenue, and to provide added guidance on the procurement of these services.

PSC urges that serious consideration be given to our suggested policy and procedural improvements and to our proposed amendment to FAR Part 37 governing professional and technical services procurement (see Appendix). Failure to do so will exacerbate the government's present inability to procure professional and technical services with a proper emphasis on quality.

Let me reiterate that we would be pleased to work with you and your staff on the above-proposed acquisition reforms.

Thank you for the opportunity to testify today. We will be happy to answer any questions you might have.

APPENDIX

PART 37 - SERVICE CONTRACTING
37.X - PROFESSIONAL AND TECHNICAL SERVICES CONTRACTING

37.X00 SCOPE OF SUBPART

(a) This Subpart prescribes policies and special procedures for acquiring professional and technical services, where higher levels of quality productivity are always desired.

37.X01 DEFINITIONS

(a) Professional and technical services means services provided by skilled personnel often possessing college level education, advanced degrees and/or extensive operational experience in scientific, analytical or technical disciplines. Normally, these professional and technical services will be provided by a firm that can retain and successfully integrate the efforts of such personnel to accomplish a desired task. The combination of these workforce attributes and organizational management results in the ability to bring higher levels of quality/productivity to the performance of complex tasks, and to provide knowledgeable information, assessments, assistance and recommendations relating to sophisticated and important national programs. Although Research and Development and Architect-Engineering services are also considered to be professional and technical services, policies and procedures for Research and Development and Architect- Engineering services are covered in FAR Parts 35 and 36, respectively.

Other examples in which professional and technical services are used include, but are not limited to:

(1) Scientific, engineering, systems design and engineering and field engineering services

(2) Software design, development and enhancement, systems analysis and integration services and simulation modeling

(3) Test and evaluation services, verification and validation services

(4) Communications and telecommunications services

(5) Program management services involving analysis, logistics and recommendations relative to new, emerging or in-service systems and technologies

(6) Training and instructional services

(7) Requirements analysis, economic analysis and cost analysis

(8) Policy analyses, investigations, research and evaluation dealing with strategic options, force structure requirements, tradeoff evaluations among competing technical, operational and economic factors, etc.

(9) Financial analyses, accounting and auditing

(10) Consulting services

(11) Repair, modification and modernization of in- service weapon systems, equipments, parts and components

(12) Management, operation and maintenance of supplies, systems, facilities or equipments.

37.X02 POLICY.

(a) Contracts for professional and technical services shall be used to obtain high quality services not otherwise available or economically obtainable within civil service and/or military resources. Contracts for such services are directed toward development of new technologies, advancement of technology, use and optimum employment of existing technologies, and assistance and support of various government missions. In all cases, higher levels of quality and productivity are essential in ensuring reliability, operational readiness and safety, among others. Such higher levels of quality/productivity require higher-skilled, higher-educated personnel developing creative and innovative approaches to complex issues. The very nature of professional and technical services dictates that quality and high levels of expertise must not be compromised. The contracting process for such services shall be used to encourage the best sources from the professional, technical, scientific and industrial communities to participate in government programs, and must provide an environment in which the optimum, affordable skill, flexibility and quality levels can be obtained at reasonable and realistic prices.

(b) With respect to professional and technical services, the procurement procedures specified in Subsections 37.X06 and 37.X07 shall be used to ensure that appropriate levels of innovation and creativity within prescribed quality/quantity parameters are acquired at realistic prices. In selecting professional and technical services contractors, greater weight shall be given to technical factors than to cost factors. Cost realism shall be a key cost factor.

(c) The contracting officer, with assistance from cognizant technical personnel, shall determine the level of quality (i.e., skill/education levels, innovative technical/management approaches, in-depth corporate experience, etc.) required prior to each procurement for professional and technical services.

37.X03 MANAGEMENT RESPONSIBILITIES.

(a) In the procurement of professional and technical services, both the contracting officer and the government program manager/technical representative have certain responsibilities. The ultimate responsibility for the solicitation, evaluation, source selection and performance of services contracts rests with the contracting officer. The program manager/technical representative has a critical responsibility to assist the contracting officer, particularly in areas related to the work effort to be performed. The respective responsibilities of both the contracting officer and the program manager/technical representative are set forth below.

(b) Contracting officer - The contracting officer is responsible for ensuring that a proposed contract action utilizes the proper contract type, has the proper period of performance and, in the case of competitive procurements, applies the proper procurement method and associated evaluation and selection criteria are applied. For these purposes, the contracting officer shall:

(1) Determine whether the proposed service is for a personal or nonpersonal services contract using the definitions in 37.101 and the guidelines in 37.104:

(i) In doubtful cases, obtain the review of legal counsel.

(ii) Document the file (except as provided below) with (a) the opinion of legal counsel, if any, (b) a memorandum of the facts and rationale supporting the conclusion that the contract does not violate the provisions in 37.104 (b), and (c) any further documentation that the contracting agency may require. Nonpersonal services contracts are exempt from the requirements of this subparagraph.

(2) Where statements of work and/or manpower requirements cannot be defined with precision, use a cost reimbursement contract to acquire services. It is the responsibility of the contracting officer to insure that all prospective offerors are proposing to the same government estimated level of effort for term type contracts.

(3) Perform acquisition planning to determine the most appropriate contract period of performance and to ensure that the maximum levels of efficiency and productivity are achieved. The contracting officer shall work closely with the program manager/technical representative in making this determination.

(4) Ensure, to the maximum extent set forth in the Competition in Contracting Act (CICA), that competition is used to acquire services. The contracting officer shall use the procurement procedures set forth in Sections 37.X06 and 37.X07 in procuring professional and technical services.

(c) Program Manager/Technical Representative - The program manager/ technical representative is responsible for assisting the contracting officer in preparing the statement of work; selecting the required labor categories, position descriptions and estimated manhours; identifying the level of quality, innovation and creativity needed for successful contract performance; and, in the case of competitive procurements, for determining the evaluation criteria and technical-to-cost ratio (subject to contracting officer approval) and for leading the evaluation and scoring of technical proposals. For these purposes, the program manager/technical representative shall:

(1) Define the technical objective in clear, concise language identifying specific tasks to be accomplished, period of performance, deliverable items and, if required, identifying special items needed such as facilities, equipment, computer models, etc.

(2) For term-type contracts, enumerate the categories of labor to be used giving special consideration to the position descriptions/ qualifications, such as educational levels and, where appropriate, specifying where equivalent professional and technical qualifications are or are not appropriate.

(3) Determine the number of person-hours per category of labor based upon the government's best estimate, recognizing that the

levels-of- effort will fluctuate in the pursuit of the technical objective(s).

(4) Identify those technical areas in which increasing levels of quality, innovation, originality and creativity are sought, and for which higher personnel qualifications exist and higher technical scores will be given.

(5) Establish technical evaluation criteria and point values for evaluating and scoring technical proposals that consider the required level of quality, technical approach, personnel (resume) capabilities, corporate experience, organization and management, facilities and special requirements. Provide inputs to the contracting officer on the appropriate technical-to-cost ratio and the relative importance of each technical and cost evaluation criterion. Provide leadership in the evaluation of technical proposals.

37.X04 STATEMENTS OF WORK.

(a) A clear and complete work statement defining the mission requirements and/or the end objectives is essential. The work statement should allow contractors freedom to exercise innovation and creativity. Work statements must be individually tailored by technical and contracting personnel to establish the government's desired technical requirements and to obtain the highest levels of competence as well as to encourage flexibility and creativity in contractor responses.

(b) The contracting officer shall determine whether the work to be performed requires a completion or term type contract. The wording of the work statement should be consistent with the type and form of contract to be negotiated.

(c) Where professional and technical services are being acquired, the quality of such services received by the government is of utmost importance. The statement of work shall specify technical areas where higher levels of quality/productivity are demanded. Such areas may include requirements for highly educated (i.e., master's and doctorate degrees) personnel; highly-skilled (i.e., 10 to 20 years specialized experience) personnel; innovative technical approaches; creative management techniques; automated/labor-saving tools, equipment or software; and in-depth corporate experience in a specific area. Government personnel must exercise a high level of professional judgment in order to define the government's requirements and to define the level of quality/innovation needed to satisfy these requirements. The statement of work should clearly and specifically identify such quality requirements to the contractor so the contractor fully understands the government's requirements. In addition, special care is required to identify and define professional and technical personnel (resume) requirements. Where a specific level of education, experience or certification is required, the personnel and staffing requirements should clearly indicate that equivalent education, experience or certification is not applicable and will not be considered. Where equivalent education experience or certification is acceptable, the personnel and staffing plan should so indicate. The contracting officer must ensure that an acceptable level of quality is being procured via the request for proposal, the selection and evaluation criteria, the statement of work and any other special provisions associated with the procurement. When procuring professional and technical services, the contracting officer shall ensure that the solicitation contains evaluation criteria that give greater weight to technical excellence than to cost and emphasize cost realism.

(d) In preparing work statements, technical and contracting personnel shall consider and, as appropriate, provide in the solicitation:

(1) A statement of the requirements, tasks to be performed, and objectives of the effort

(2) Background information helpful to a clear understanding of the objective or requirement (e.g., any known phenomena, techniques, methodology or results of related work)

(3) Information on factors such as personnel, environment and interfaces that may constrain the results of the effort

(4) Reporting requirements and information on any additional items that the contractor is required to furnish (at specified intervals) as the work progresses

(5) The type and form of contract contemplated by the government and an estimate of applicable professional and technical effort

(6) Any other considerations that are peculiar to the work to be performed or give rise to increased risk on the part of the

37.X05 CONTRACTING METHODS AND CONTRACT TYPE.

(a) In contracting for professional and technical services, the precise specifications necessary for sealed bid procurement are generally not available, thus making negotiations necessary. However, the use of negotiations does not change the obligation to obtain competition to the maximum practicable extent. The provisions of FAR Part 6 requiring competition apply to professional and technical service contracts. The method of contracting used to provide for competition should vary with the type of service being acquired.

(b) Selecting the appropriate contract type is the responsibility of the contracting officer. Because of the importance of technical and quality considerations in professional and technical services contracting, the choice of contract type should be made after obtaining the recommendations of the program manager/technical representative. Although the government ordinarily prefers fixed-price arrangements in contracting for material, this preference does not normally apply to services contracting and should only be used to the extent that the statement of work and specifications can be well defined and the project has a low level of technical risk.

(c) In selecting the contract type for a professional and technical service contract, the contracting officer must analyze the contract requirement and work statement, applying guidance from FAR Part 16.

37.X06 SOLICITATIONS.

(a) In the procurement of professional and technical services, the term "solicitations" shall mean Requests for Proposals (RFPs) as further described in FAR Subpart 15.4. All such RFPs shall be issued on a negotiated competitive basis; sealed bidding shall not be used to acquire professional and technical services.

(b) Solicitations shall require offerors to describe their technical and management approaches, identify any perceived technical uncertainties, and discuss possible approaches for the resolution of such uncertainties. The solicitation shall require offerors to include in the proposal planned subcontracting or use of consultants.

(c) Solicitations shall require that proposals be organized so that the technical portions can be efficiently evaluated by the government's technical evaluation team. Solicitations and evaluation of proposals shall be planned to minimize offerors' and government expense.

(d) Professional and technical services solicitations shall contain evaluation factors to be used to determine the most technically competent. Technical competency shall be scored and ranked. Such evaluation factors include:

(1) The offeror's understanding of the scope of the work

(2) The approach proposed to accomplish the scientific and technical objectives of the contract or the merit of the ideas or concepts

(3) The availability and competence of experienced engineering, scientific, technical or other personnel

(4) The offeror's experience

(5) Pertinent novel ideas in the specific branch of science and technology involved

(6) The availability, from any source, of necessary research, test, laboratory or shop facilities

(7) The availability of productivity-enhancing tools such as software programs, computer models, data bases, etc. relevant to the work

(e) In addition to evaluation factors for technical competence, the contracting officer shall consider, as appropriate, management capability (including cost management techniques), subcontracting practices and any other significant evaluation criteria (e.g., the realism of cost estimates in relation to technical proposals for cost-reimbursement contracts).

(f) Cost or price shall not be the controlling factor in selecting a contractor, but, it shall not be disregarded in arriving at a selection that best satisfies the government's requirement at a fair and reasonable price. Cost realism, based upon the project complexity and degree of quality required by the statement of work specifications, shall be a key evaluation factor. A cost realism judgment shall also be based on the validity of the costs proposed for specific cost elements, e.g. labor, material, other direct costs and indirect costs. Proposals that offer unrealistically low prices or overly optimistic productivity shall be downgraded or considered unreasonable depending on the degree of unrealistic costs/productivity.

(g) The contracting officer shall ensure that each prospective offeror fully understands the details of the work, especially the government interpretation of the work statement. If the effort is unusually complex, prospective offerors shall be given an opportunity to comment on the details of the requirements contained in the work statement through the use of preproposal conferences or draft solicitation documents.

37.X07 EVALUATION AND SOURCE SELECTION.

(a) A distinctive factor in the acquisition of professional and technical services is the unusual importance assigned to exercising a high level of professional judgment by government procurement personnel in establishing the government's requirements, selecting and ranking the evaluation factors that will control source selection and evaluation, and in determining the level of quality needed to satisfy government requirements. The procurement of quality services is a unique and difficult task. The determination of the level of quality required to satisfy government requirements requires a professional judgment unique to services procurement and varies from solicitation to solicitation. Projects that require sophisticated technical approaches, complex methodologies and creative solutions to complex developmental and operational situations demand high levels of quality in the professional and technical services purchased by the government. In these cases, the government should seek innovative ways of measuring quality in the evaluation process. Where quality is measured, a cost/benefit approach should be employed and consideration given to paying appropriate premiums for measured increments of quality. Adherence to the "best value" (most advantageous to the government) concept is appropriate. Best value also provides appropriate flexibility for award to other than the low offeror when the cost/benefit of an offer of higher quality is in the government's favor. A professional and technical services contract should normally be awarded to that firm that proposes the best overall value to the government.

(b) The method for acquisition of professional and technical services is Competitive Negotiated Procurement and is comprised of the following elements:

(1) If the contract requirement is unusually complex, agencies should issue RFPs for public comment, except where precluded by time considerations.

(2) Requests for proposals shall specify the relative weighting of the technical proposal and cost proposal (i.e., the technical-to-cost ratio) in clear terms, such as "technical has three times greater value than cost". The use of numerical terms (i.e., 90/10, 80/20, 70/30, etc.) also is allowed.

(3) An array of evaluation criteria shall be applied to technical and cost scoring (See 37.X07 (c) below). These factors shall be supplemented based on particular requirements for services.

(4) Both the technical and cost proposals shall be scored. The scoring methodology for technical proposals shall use a set of qualitative ratings (i.e., poor, fair, good, excellent, etc.), which are converted to quantitative scores (i.e., excellent equals 90 to 100 points, poor equals 40 to 50 points, etc.). This serves to reduce the clustering of numeric scores, which often contributes to "technical leveling."

(5) Only in rare instances should cost be weighted more than 40 points in a 100-point system. In most cases, the weighting given to cost should be less than 40 points based on the increased importance of technical and quality considerations. A Compensation Plan for Professional Employees in accordance with FAR 52.222-46 always shall be submitted as a part of the cost proposal.

(6) Technical and cost proposals shall be submitted simultaneously. In the majority of cases, technical proposals shall be evaluated and scored by the technical evaluation team prior to the opening and analysis of cost proposals. In the interest of time, technical and cost proposals may be scored concurrently by separate evaluation teams, and the procedures in 37.X07 (b) item 11 below, shall then be used.

(7) In evaluating technical proposals, special consideration shall be given to the quality and relevance of past performance on similar work (supported by reference checks) and innovation/creativity. Special consideration shall also be given to factors that indicate differential productivity or quality expectations between offerors.

(8) Technical proposals first shall be evaluated on a qualitative basis only. Those technical proposals, which are deemed to be unacceptable or not capable of being made acceptable, shall be

(9) Written or oral discussions shall be conducted for those technical proposals remaining in the competition prior to any quantitative scoring of the technical proposals. Technical clarifications then shall be submitted, as required, from each offeror. However,

(10) Following submission of technical clarifications, final qualitative technical ratings are determined and converted to quantitative

scores by the technical evaluation team, without reference to the cost proposals. Once the quantitative technical scores have been determined, there shall be no further discussions of the technical proposals. Technical scores shall not be subject to any changes, and their relative ranking shall be preserved. After these technical scores are established, cost proposals may be scored (but see 37.X07 (b) item 6 above).

(11) A preliminary scoring of competitive cost proposals shall be done based upon price analysis. Quantitative technical scores and preliminary cost scores are weighted based on the technical-to-cost ratio, and the weighted scored combined to determine a "composite score." A competitive range is established which should include all proposals that have a reasonable chance of being selected for award. Those proposals determined not to have a reasonable chance for award shall no longer be considered for selection, and the unsuccessful offeror(s) shall be notified in writing at the earliest practicable time.

(12) Those offerors whose proposals are deemed to be in the competitive range shall be given an opportunity to revise their cost proposals based on revisions to their technical proposals resulting from prior technical discussions. Cost proposal revisions related to the technical revisions should be so identified. Other cost revisions shall be separately identified and fully explained. The revised cost proposals, or the original cost submissions if no revisions are made, are the "Best and Final Offers" (BAFOs) to be used for final cost evaluation.

(13) BAFOs then shall be evaluated and scored. Special consideration shall be given to cost realism, including past performance. Program personnel familiar with the contract requirement shall be included on the BAFO evaluation team. The BAFO shall be required to reflect the level-of-effort and personnel contained in the technical proposal. The BAFO shall be verified for realism of the proposed costs for labor and other elements, using the criteria set forth in 37.X07 (c) item 5 below. To the maximum practicable extent, BAFOs should be evaluated on a standard person-year basis. Demonstrated cost realism is equally important in both cost reimbursement and time and material contracts. The lowest evaluated cost/price determined to be realistic and reasonable

should receive the highest cost score.

(14) Once the technical and BAFO scores are compiled, final weighted scores are calculated. Composite scores are determined by adding together the two respective weighted scores. The offeror with the highest composite score should normally be determined the winner. The government always should seek to obtain the optimum, affordable level of quality at reasonable and realistic

(15) The use of more than one BAFO is to be avoided in order to prevent the potential for technical leveling/cost auctioning, which are specifically prohibited by FAR Subpart 15.610. Only in those instances where corrections/amendments to the solicitation are required (after issuance and after receipt of proposals), which have a substantive impact on contractor proposed technical items or cost/price, shall a second BAFO be used. A second BAFO shall be requested only after written findings have been prepared outlining the circumstances that require its use. These findings shall be approved at a level above the contracting officer.

(c) Examples of appropriate evaluation criteria are as follows:

(1) Technical Approach

- Understanding of problem
- Unique problem solving approaches (i.e., innovation/creativity)
- Response to sample questions/sample tasks
- Special resources and tools (i.e., computers, software models, laboratories, simulation, prototyping)
- Evidence of the ability to successfully execute the proposed technical approach.

(2) Management Approach

- Appropriateness of organizational structure and staffing
- Management control and reporting and cost control/schedule systems
- Quality assurance and productivity considerations

- Evidence of the ability to successfully execute the proposed management approach
- Small business subcontracting plan (PL 95- 507).

(3) Corporate Experience

- Quality of reference checks, especially with respect to work of a similar or related nature
- Experience in projects of comparable scope and complexity
- Experience in high quality, demanding projects
- Experience in similar operational and technical environments.

(4) Personnel

- Key technical and specialized personnel and staffing plan
- Qualifications of proposed personnel (e.g., level of expertise, comparable past experience, academic credentials, special skills and training)
- Evidence of the ability to successfully deliver the proposed personnel or the level of personnel technical capability and quantity
- Access to specialized talent elsewhere in company or within multi-contractor organization
- Use of technical advisors/consultants/experts.

(5) Cost Realism/Reasonableness

- Appropriate pricing for all personnel proposed, reasonable practices in calculating labor hours per year, total hours appropriate to scope, etc.
- Conformity of proposed cost structure to the task (work breakdown) structure defined in the statement of work
- Appropriateness of contingent or special cost elements (i.e., software simulation to predict performance)
- Verified past history of cost realism as evidenced by

Reference checks of prior contract performance

- Appropriateness of labor unit costs (i.e., number of hours worked by average employee)
- Use of "standard" person (i.e., number of hours worked by average employee) for all offerors
- Appropriateness of indirect costs as evidenced by information from price analysis (i.e., overhead, G&A) or verification of historical indirect costs by audit
- Added-value represented by indirect costs such as independent quality audits, added technology availability, product enhancements
- Completeness and appropriateness of other direct costs (ODCs)
- The adequacy of the offeror's Compensation Plan for Professional Employees including a clear understanding of the work requirement, reasonable relationship of compensation to job categories/skill levels required and the ability to provide uninterrupted work efforts of high quality.

37.X08 POST-AWARD DEBRIEFING

(a) An effective procurement process requires a reasonable post-award debriefing for unsuccessful offerors. The post-award debriefing is an integral part of the procurement process and must reveal to the maximum extent possible the rationale upon which the award was made. In order to ensure that future procurements can be focused to satisfy the government's needs, the post-award debriefing is a verification procedure designed to disclose the process leading to fair and reasonable awards.

(b) The following types of information shall be disclosed during the post-award debriefing: the factors used in determining award; the relative weighting of those factors in relation to other offerors; the cost elements and cost realism analyses considered and evaluated for award; the relative weighting of evaluation factors in the final award decision; the actual scoring of technical and cost proposals for all offerors.

(c) Whenever possible, the contracting officer shall disclose sufficient information to assure offerors that an evaluation was made in accordance with the evaluation criteria set forth in the solicitation and the statement of work presented to the offerors. Proprietary and trade secret information shall not be disclosed.

37.X09 SPECIAL PROVISIONS

(a) The use of special provisions in professional and technical services contracting, which inhibit the government's and the contractor's ability to exercise flexibility and management control over the performance of the work effort, is highly discouraged. Such provisions include but are not limited to: ceilings or "caps" on direct labor rates and/or indirect (i.e., overhead and G&A) rates in cost reimbursement contracts, inflexible restrictions on substitutions of personnel, restraints on the fluctuation of the labor mix, artificial ceilings on other direct costs (ODCs), attempts to disallow costs considered allowable in FAR Part 32 or which are in compliance with Cost Accounting Standards, and clauses which force the offeror into noncompliance with its disclosed Cost Accounting Practices, previously accepted by the government.

Senator BINGAMAN. Thank you very much.

COMMERCIAL PRODUCTS

Mr. Lewis, let me start by asking you a couple of questions, if I could. On page 8 of your testimony you talk about commercial products. It indicates that the conclusion of witnesses—the Boeing and Honeywell witnesses whose testimony you are providing to us for this record—is that we can move toward much greater use of commercial products in the Defense Department, or by the Defense Department, without significant legislative changes.

We had a hearing yesterday in the Governmental Affairs Committee where Eleanor Spector, who, of course, has a key position in procurement in the Department of Defense, testified very strongly that they felt the problem was legislative and that they had proposed some legislative changes which they had sent to the Office of Management and Budget nearly 2 years ago to address some of the legislative problems that they felt prevented them from buying more commercially available products.

Your testimony seems to contradict that or disagree with it. Would you elaborate a little bit? Is this one that Congress needs to address here with legislative changes? Is it something the administration can do? What is the problem?

The other testimony we got from Mr. Sanders in the Department of Defense, who, according to his testimony is the one person on payroll who spends half of his time working on this, said that they were buying more commercial products in 1976 and 1977 when they had a pilot program on than they are today.

[The information referred to follows:]

ELECTRONIC INDUSTRIES ASSOCIATION
SUBMISSION FOR THE RECORD
OF HEARINGS BEFORE THE SENATE ARMED SERVICES SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY
JUNE 2, 1989

Suggested Statutory Changes for Subcommittee Consideration

A. Raise the threshold for requiring certification of cost or pricing data under P.L. 87-653 from $100,000 to $500,000. (See enclosed issue paper 1.A.)

B. Create commercial products procurement advocates in the military services and the Office of the Secretary of Defense to review current and proposed regulations and policies, report on their effects on commercial products suppliers, and recommend policy revisions needed to encourage use of commercial products. These individuals should be given the task of developing a test program in each of the services in which commercial-style terms and conditions can be used in acquiring commercial products. (See Enclosure 1.B.i. - EIA testimony by B. Dan Pinick of the Boeing Company dated May 16, 1989, pages 6-9. Also enclosed is our statement 1.B.ii., which supports concerns raised in the Boeing Company statement from the standpoint of a major subcontractor, Honeywell Inc.).

Enclosure 1.A.

EIA ISSUE PAPER
CERTIFICATION THRESHOLD FOR COST AND PRICING DATA CURRENTLY IS SET TOO LOW

ISSUE:

Should the $100,000 threshold for certification of cost and pricing data under the Truth in Negotiations Act of 1962 (P.L. 87-653) be raised to a more reasonable level to alleviate administrative burdens on the defense supplier base?

DISCUSSION:

The current $100,000 threshold for certification of cost and pricing data is unrealistically low given inflation trends in the 27 years since its establishment in 1962, and the finite audit resources of the Department of Defense. A $500,000 threshold would be reasonable and responsible from a public policy standpoint, and would alleviate a major burden to small and medium sized businesses at every level of the supplier chain.

For some two years in the 1982-84 time frame, Congress did take action to raise the threshold to $500,000, an action which brought real administrative and paperwork burden relief to members of EIA and other large and small businesses throughout the supplier chain. This was particularly true as it created relief for subcontractors who otherwise would have been required to certify to primes and larger subs with whom they do business. In the current environment, certification continues to represent a burden to commercial firms and smaller firms endeavoring to enter or expand their participation in the defense industrial base.

At hearings before the Senate Committee on Governmental Affairs in April 1984, then-Assistant Deputy Under Secretary of Defense for Acquisition Harvey Gordon testified in favor of retaining the higher threshold, recognizing the appropriateness of devoting audit resources to other areas where the greatest payoff in dollar terms might be anticipated. He noted that the $500,000 threshold was requested and supported by DoD because it resulted in a 65% reduction in paperwork burden for industry while still ensuring oversight of 93% of the contract costs.

We believe these statements are as true today as when they were cited in 1984, the more so since five more years of inflation and contract actions valued in excess of $500,000 have gone forward.

CONCLUSION:

For these reasons, we urge the Subcommittee on Defense Industry and Technology to support an amendment to the DoD Authorization Bill specifically to raise the certification threshold of P.L. 87-653 from $100,000 to $500,000.

Enclosure 1.B.i.

HEARINGS BEFORE THE SENATE GOVERNMENTAL AFFAIRS SUBCOMMITTEE ON OVERSIGHT OF GOVERNMENT MANAGEMENT

TESTIMONY ON THE ACQUISITION OF COMMERCIAL PRODUCTS

B. DAN PINICK
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THE BOEING COMPANY
AND
PRESIDENT, BOEING AEROSPACE & ELECTRONICS

REPRESENTING

ELECTRONIC INDUSTRIES ASSOCIATION

MAY 16, 1989

PREPARED STATEMENT OF B. DAN PINICK

Good morning. My name is Dan Pinick, I am a Senior Vice President of The Boeing Company and President of Boeing Aerospace and Electronics. Today I am here representing the Electronic Industries Association. I am pleased to be here this morning to discuss some of the impediments to the acquisition of commercial products by the United States Government. I believe industry, Congress and the DoD agree that appropriate use of commercial and other nondevelopmental products by the Government to fulfill Government requirements could significantly reduce the cost of those requirements, reduce acquisition time and provide operationally-proven quality items for Government needs.

The benefits of using commercial products have been studied as early as 1972, and as late as 1986, when the President's Blue Ribbon Commission on Defense Management (the Packard Commission) recommended the expanded use of commercial products and "commercial-style" competition in the defense procurement process. Thereafter, the 99th Congress enacted a law requiring a "preference for nondevelopmental items" (commercial products) and the FY89 Office of Federal Procurement Policy Reauthorization Act included a requirement to establish an advocate for the acquisition of commercial products. Therefore I will not dwell on the benefits of using commercial products on the assumption that their utility has been recognized. Instead, I will focus on several problems that need to be solved before these benefits can be fully realized.

Before going any further, I would like to explain the dual marketplaces served by The Boeing Company. First, The Boeing Company is the largest producer of commercial aircraft in the free world. Currently, about seventy percent (70%) of our total corporate sales is to commercial customers. At the same time, The Boeing Company is a major defense contractor. We are traditionally one of the top ten defense prime contractors.

For the most part, our Government effort is separate from our commercial activity. Our Government divisions do business with the Government and have the resources and the expertise in place to comply with the military-peculiar requirements in Government contracting. Our Commercial Airplanes division has supported the sale of military commercial products in the past, such as 707s used for AWACs and E-6; and 747s used for E-4, Air Force One, and NASA's Space Shuttle program. We would like to continue selling commercial aircraft to the Government because we believe our commercial products offer many benefits in terms of quality, performance, availability and price.

We have experienced significant problems in our Commercial Airplanes division when supporting the sale of commercial aircraft to the Government. One of the most significant problems is the flow down of Government contract terms and conditions to our suppliers. Many suppliers to the Boeing Commercial Airplanes division are commercial companies or divisions who do no business with the Government. The relationships we have with these suppliers have existed for many years and we look upon our suppliers as partners and an arm of our production capability. These long-term partnerships have resulted in our mutual success in producing innovative, high-quality commercial aircraft at prices established by the competitive, commercial marketplace. Many of these suppliers are accustomed to operating only in the commercial world using commercial business arrangements and are not inclined to reorganize themselves to do business with the United States Government.

Under the current Government acquisition system when we receive a contract for commercial aircraft, there are many Government-peculiar terms, conditions and specifications that we are required to flow down to subcontractors, vendors and suppliers. In many cases the requirement to flow down these terms and conditions finds its origin in United States statutes. In some cases, such as cost or pricing data, there are exemptions that may be available for commercial products. However, qualifying for these exemptions is often difficult, and as a practical matter may not be available. Moreover, the myriad of remaining clauses and Government specifications are generally unacceptable to our commercial suppliers because they are organized to produce and sell their products using commercial business arrangements.

These flow down requirements are a particular problem because of the way in which commercial programs are developed. In a commercial environment, the selection of sources and the acquisition process for raw materials, parts, subassemblies and components is set in motion and often completed well in advance of the orders being placed by the commercial customers. The Government order containing flow down requirements cannot therefore, in many instances, be complied with after-the-fact by our suppliers and vendors. As I indicated, in most of these cases, there is no practical waiver or deviation authority for commercial products. Even where waiver and deviation authority is available to the DoD, there is a general reluctance to pursue those waivers and deviations, especially where the procuring activity is required to elevate the matter to the Head of the Agency. Taken to their extreme, flow down requirements can create an absolute barrier to purchase of commercial aircraft and commercial spare parts.

Furthermore, the problem does not end with the delivery of the aircraft. The problem continues for many years because of the Government's spare parts requirements to support the aircraft.

Boeing's recent experience in attempting to sell a commercial aircraft to the Government was our bid for the Navy's Long Range Air ASW Capability Aircraft (LRAACA). Boeing's proposal for the aircraft was based on the use of a modified version of the 757 commercial jet airliner. At the time of the proposal to the Navy, the commercial 757 was a program that had been in existence for about ten years. This means that Boeing's network of suppliers and vendors supporting the 757 was firmly established with contractual arrangements in place.

For this reason, Boeing proposed that certain Government contract clauses and military specifications typically applied to new Government-designed aircraft be waived. Boeing anticipated that this approach, which met or exceeded the Navy's operational requirements, would allow the Navy to benefit from the advantages offered by the 757's established commercial production and supplier environment.

Nineteen Federal Acquisition Regulation (FAR) clauses (attached) were identified by Boeing as requiring flow down and in order to comply with all the Government flow down requirements would have meant reopening and attempting to renegotiate approximately 3,900 vendor contracts, most of which had been in place since the beginning of the 757 program.

RECOMMENDATION:

We believe there is a large base of high-quality commercial suppliers to which the U.S. Government may not have access because of the terms and conditions associated with Government contracts. Ideally, Congressional preference for the acquisition of commercial products and nondevelopmental items could, to a large measure, be achieved through meaningful regulatory reform. However, this simply has not occurred.

Therefore, we perceive a need for new legislation permitting the acquisition of commercial products with the standard commercial terms and conditions used by the manufacturer of the product.

Recognizing this is a major departure from policies that currently exist and that there may be concerns regarding such a dramatic change, perhaps a trial program could be established, with results to be evaluated following a reasonable period of time. To accommodate this program, I recommend the creation of a Commercial Procurement Authority whose office would be empowered to specifically and exclusively utilize the enabling commercial products legislation. In this way, the interest of the Government would be protected in that the program would be controlled and the results known without having permanently changed the entire acquisition process.

One possible approach to the problem is to statutorily provide for waiver of flow down requirements where the product has met the test of "commerciality" on the same basis as for obtaining an exemption from the requirement to submit cost or pricing data. It is already recognized (under law and regulation) that if a product has a price that is "based on established catalog or market prices" and is sold in "substantial quantities" to the "general public", the Government need not require the submission or certification of cost or pricing data. In turn, it appears logical that the manufacturer of this same commercial product should be equally relieved of other obligations that are inconsistent with commercial terms.

Critical to this approach, however, is the need to further clarify and broaden the definition as to what constitutes the "commerciality" of a particular product. This can be done by redefining some of the terms having to do with commerciality in the Federal Acquisition Regulation.

OTHER RECOMMENDATIONS:

Short of such a broad legislative initiative, there is no way to completely eliminate these problems. Nevertheless, let me suggest changes that can make a difference even under existing law.

First, appropriate language should be added to the Federal Acquisition Regulations which recognizes that in those situations where the Government acquisition includes materials, parts, subassemblies and components that have been routinely produced and ordered by a manufacturer as part of its ongoing commercial activities, the suppliers and vendors of the prime contractor shall not be considered "subcontractors" for purposes of flow down of Government terms and conditions. This would help eliminate the "after-the-fact" imposition of Government flow down requirements.

Second, when commercial sources are known to exist that meet Government requirements, the Government's acquisition plan should encourage the Services to use all available waiver authority requested by the prime contractor and its suppliers and vendors of commercial products.

Third, the DoD should establish a high-level Commercial Products Advocate to work with the OFPP Advocate required by the FY89 OFPP Reauthorization Act to:

(1) Review all proposed procurement regulations to determine those which encourage or discourage the acquisition of commercial products.

(2) Provide recommendations to the Secretary of Defense and the Administrator OFPP, as to what statutes and procurement regulations should be rescinded or modified to encourage the acquisition of commercial products.

(3) Provide recommendations as to methods for simplifying procurement regulations governing the acquisition of commercial products.

In conclusion, I'd like to again point out that without statutory enabling language which, while preserving other public policies, creates a vehicle for awarding Government contracts for selected commercial products using those terms, conditions and specifications that are used by the manufacturer of the product in the commercial marketplace, the Government will not adequately benefit from the use of high quality commercial products at competitive prices.

Thank you very much for providing me the opportunity to present our views on this important issue. I would be pleased to answer any questions you may have.

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Attachment to
B. Dan Pinick
Testimony on the Acquisition
of Commercial Products

TITLE	CLAUSE
RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT	FAR 52.203-6
ANTI-KICKBACK PROCEDURES	FAR 52.203-7
PRIORITIES, ALLOCATIONS AND ALLOTMENTS	FAR 52.212-8
EXAMINATION OF RECORDS BY COMPTROLLER GENERAL	FAR 52.215-1
SUBCONTRACTOR COST OR PRICING DATA	FAR 52.215-24
SUBCONTRACTOR COST OR PRICING DATA-MODS	FAR 52.215-25
UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS	FAR 52.219-8
SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN	FAR 52.219-9
UTILIZATION OF LABOR SURPLUS AREA CONCERNS	FAR 52.220-3
LABOR SURPLUS AREA SUBCONTRACTING PROGRAM	FAR 52.220-4

CERTIFICATION OF NONSEGREGATED FACILITIES	FAR 52.222-21
EQUAL OPPORTUNITY	FAR 52.222-26
AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS	FAR 52.222-35
AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS	FAR 52.222-36
CLEAN AIR & WATER	FAR 52.223-1, 2
COST ACCOUNTING STANDARDS (CAS)	FAR 52.230-3
ADMINISTRATION OF COST ACCOUNTING STANDARDS	FAR 52.230-4
PREFERENCE FOR PRIVATELY OWNED U.S.-FLAG COMMERCIAL VESSELS	FAR 52.247-64
SPECIAL PROHIBITION ON EMPLOYMENT	DFAR 52.203-7001

Enclosure 1.B.ii.

HEARINGS BEFORE THE SENATE GOVERNMENTAL AFFAIRS SUBCOMMITTEE ON OVERSIGHT OF GOVERNMENT MANAGEMENT

TESTIMONY ON THE ACQUISITION OF COMMERCIAL PRODUCTS

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MANAGER, CONTRACT MANAGEMENT
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BUSINESS & COMMUTER AVIATION SYSTEMS DIVISION

REPRESENTING

ELECTRONIC INDUSTRIES ASSOCIATION

MAY 16, 1989

PREPARED STATEMENT OF NAOMI M. WILLIAMSON

Good morning. I am Naomi Williamson, Manager of Contracts for the Business and Commuter Aviation Systems Division (BCASD) of Honeywell and I am here representing the Electronic Industries Association. Honeywell applauds efforts to encourage Government procurement of commercial and nondevelopmental items to save money and take advantage of technological advances that are available in the marketplace. My purpose in attending this hearing is to share some of Honeywell's experiences as a commercial contractor with whom the Government or Government primes have tried to contract. I hope our experiences will help illustrate some of the problems that must be solved in order for the commercial procurement initiatives, like those recommended by the Packard Commission, to succeed.

Because Honeywell is a well known defense contractor, you might think that knowledge of Government procurement regulations transfers from the defense divisions to the commercial divisions. Actually, it does not as there typically is no need for it. Honeywell's defense divisions have expertise in the regulations and comply with the Government terms of doing business--but the commercial and defense divisions operate quite independently from each other. Therefore, the experiences I plan to share with with you today should be similar to those any commercial contractor would face with Government procurements. Let me start with a brief description of our products and marketplace.

BCASD designs, develops, integrates and manufacturers avionics systems for executive aircraft and commuter aircraft--aircraft small than Boeing or McDonnell Douglas air transport aircraft, but more expensive than small general aviation aircraft, such as two to four seat Cessna or Piper aircraft. Examples of the aircraft manufacturers with whom we contract are: Gulfstream, Dassault, Aerospatiale, Canadair, Fokker, deHavilland, British Aerospace, Beech, and Cessna. We also have a dealer network and a product support network for the businesses and airlines that use our equipment.

BCASD was formed specifically to answer the demand this market has for lower cost avionics combined with quick response time for implementation of new features demanded by corporate pilots.

Generally, our products include sensors, controls and cockpit displays. Examples are: Automatic Flight Control Systems; Electronic Flight Instrument Systems (EFIS); Flight Management Systems; Radios; Air Data Computers; Inertial Reference Systems; Color Weather Radar, etc.

BCASD employs approximately 1400 people. In 1988, approximately .3% of the Division's revenue resulted from sales to the U.S. Government (e.g. inertial systems or radars) or for Government end use (e.g. Beech aircraft sold to the Air Force). We anticipate that U.S. Government/military customer revenue for 1989 will be approximately .7%. Such sales are accomplished generally by use of Standard Form 1412. Subject to export control, we sell products directly to foreign military customers using standard commercial terms.

I am here to talk about a recent experience BCASD had with attempting to sell commercial avionics to a Government prime for a Navy program.

THE LOCKHEED/BCASD EXPERIENCE ON THE LRAACA PROCUREMENT

After investing over two years of time and effort in pursuit of a subcontract with Lockheed for the avionics for the Navy's LRAACA (Long Range Air ASW (AntiSubmarine Warfare) Capability Aircraft) Program, on the eve of contract negotiations and award our Division made the difficult decision to withdraw our bid.

HISTORY OF THE BID

During the fall of 1986, Lockheed contacted our Division because the Navy had encouraged consideration of a commercially available Electronic Flight Instrument System for the LRAACA aircraft. The other companies from whom the Navy sought bids for the prime contract were the commercial aircraft divisions of Boeing and McDonnell Douglas. Lockheed was the only company that bid the program from a division that primarily does defense contracts.

In early 1987, Lockheed requested a presentation on the systems we could offer for use in their bid to the Navy. We gave a technology presentation showing our state-of-the-art systems on the Gulfstream IV aircraft. Those systems included six 8" x 8" CRT displays (glass cockpit) and a comprehensive integrated avionics system.

We had early discussions with Lockheed on the contracting issues. Lockheed assured us that they were under instruction from the Navy to consider commercial products and felt that to be competitive with other bidders, they would have to offer commercial avionics. Because of the Navy's stated preference for a commercial EFIS they were confident the Navy would help them resolve any commercial contracting issues that might arise on the program. We each thought the other understood what was meant by "commercial" contract terms. It was much later that we came to understand just how dissimilar our understandings were.

In October of 1987, BCASD submitted the first proposal for a comprehensive integrated system based on the Gulfstream IV system.

In May 1988, the formal Request for Proposal was received for five of the systems: Electronic Display System, Flight Management System, Microwave Landing System, Color Weather Radar System, and Passive Weather Avoidance. The RFP contained a subcontract section with an entire complement of FAR, DFAR and NAVAIR clauses incorporated by reference--and included throughout the text of the contract.

We objected and Lockheed explained that under the rules for a commercial exemption on the basis of competition, they had to give exactly the same package to all bidders. They acknowledged that they had said they would contract with us on commercial terms, but explained that the only way they could show that they ran an equal competition would be to show that everyone responded to the same package. They asked that we review the contract and take exception to anything that would not apply. It was during review of this contract that we became very concerned. Top management meetings took place between Lockheed and our Division to make sure Lockheed clearly understood that our position against accepting Government flow-down terms was absolute.

We asked whether the Navy could be approached for an early determination regarding issues of commercial contracting terms. Since Lockheed was itself in a tight competition, they were hesitant to do anything that might be construed as controversial or that might have an adverse effect on the Navy's view of their proposal. Lockheed promised to pursue resolution of the commercial contracting issues on our behalf the moment the program was awarded to them. Based on these assurances, we continued to work on our proposal.

In June of 1988, we submitted our Proposal. We stated clearly that we were responding to the military subcontract as an accommodation to Lockheed for competitive evaluation purposes and that we would be unable to accept any contract that contained requirements for cost reports, cost audit rights, quality audit and many other Government terms.

We than sent our engineers to work full time at Lockheed's facilities to assist Lockheed in preparing its proposal to the Navy.

In August we submitted our Best and Final Offer. Our final proposal contained 22 major part numbers, 7 of which might require modification (from 0% minimum to 40% maximum) for the mission and aerodynamic requirements of the aircraft.

Lockheed submitted their proposal to the Navy with a picture of our Cockpit Displays on the cover of each volume of the proposal.

Lockheed was selected by the Navy.

December 21, 1988, Lockheed submitted to the Navy a request for waiver of Government contracting terms flow-down for their subcontract with the Division.

CONTRACTUAL DIFFERENCES BETWEEN WHAT LOCKHEED GAVE US AND WHAT WE RECEIVE NORMALLY

The task of reviewing the 88 page Lockheed subcontract was monumental for a Division whose normal contract is less than 40 pages long and does not incorporate by reference a book of fine print regulations, additional special defense regulations, and additional special Navy clauses. We had no one on staff to review the contract who had current knowledge of the entire Federal procurement regulation structure. But we were not overly concerned because we believed that if we were awarded the job, Lockheed understood that a commercial contract (meaning to us standard Uniform Commercial Code terms) would be used and the Navy would support Lockheed because they had requested commercial avionics.

We made 83 exceptions or changes to the subcontract because terms were inapplicable, inconsistent with the way we do business, or inconsistent with commercial contracting terms. That means we took exception to mandatory terms right along with the rest. Examples of the Clauses we identified as inapplicable, objected to or changed follow:

Required Sources for: Miniature and Instrument Ball Bearings,
  Precision Components,
  High-Purity Silicone, and
  Jewel Bearings
  High Carbon Ferrochrome
Tooling and Material
Special Tooling and Special Test Equipment
Parts Control Program
Security Requirements
Facilities Provided by Contractor
Government Property
Modifications
Rights in Technical Data
Termination
Warranty
Incremental Funding and Schedule Adjustments
Examination of Records by Comptroller General
Audit-Negotiation
Price Reduction for Defective Cost or Pricing Data
Subcontractor Cost or Pricing Data
Cost Accounting Standards
Subcontracts Under Fixed Price Contracts
Restrictions on Subcontractor Sales to the Government
Small Business and Small Disadvantaged Business Subcontracting Plan
Labor Surplus Area Subcontracting Program
Patent Rights (annual report)

After we had put together our response and were about to submit our BAFO, it finally occurred to us that we might be in for more difficulty than we thought over the commercial contracting issues. We turned for help to our Corporate Contract Management staff and the Office of General Counsel: a resource I doubt most commercial contractors have. Of course, when they read through the list of exceptions we had taken, they raised a red flag. They advised that Lockheed could not do what we had asked them to do--not if the procurement was to be accomplished pursuant to the Federal Regulations. There is no such thing as a "commercial contract" exemption under the existing regulations. We also hired outside counsel to advise us and got the same answer.

Still trying to achieve a mutually acceptable method of contracting, we requested that a review team be put together of Government contracting experts and our commercial contracting representatives.

THE DIFFERENCE BETWEEN COMMERCIAL AND MILITARY BUSINESS

A couple of preliminary comments here might further help to understand the critical differences in how we approach our market and contracts and how a Government contractor analyzes contract terms. We look at the market, determine what might sell, develop product concepts, write the specification (we are the experts), build prototypes and present the product to the marketplace. If customers want the product, we charge them non-recurring costs adapt the product to their specific application and requirements.

Prices are only partly affected by cost. They are set by what the market is willing to pay. For large programs, prices are usually based on targets set by customers and negotiations regarding what we can provide for what the customer wants to spend. Many factors affect the pricing decisions including: knowledge of what the competition has to offer, customer's budget, customer's strategic importance, probably success of the customer's aircraft, unseating a competing incumbent supplier, and the probability of recovering our investment and making a sufficient profit to allow further investment in other products and programs.

Contract terms in a commercial environment are business decisions (can we do it and are we willing to do it?). Failure to comply results in liquidated damages or a breach of contract lawsuit. The focus remains on efficiency (accomplishing the most with the fewest people) in order to keep the cost of doing business down and stay competitive in the marketplace. In contrast, contract terms in the Government environment are legal issues (can the Government require us to do this?) with a strong focus on compliance issues because failure to comply can result in criminal prosecution of both the contractor and the Procurement Contracting Officer.

WHY WE COULDN'T DO IT

First, Government contracting is a way of life. Virtually every detail of how to operate a business has a regulation that will apply. The people who work in our division--from engineers, marketers, and accountants to assemblers--are not familiar with

Government contracting methods of doing business. This substantially increases the risk of inadvertent noncompliance, for example, the idea that uncompensated overtime is somehow unacceptable would surprise nearly every exempt employee in our division.

The LRAACA review team analyzed the issues and risks from a long term standpoint, not just a program award standpoint. As hard as we tried, we could identify no way to limit risks with this program other than to set up a separate business entity with its own manufacturing facilities, engineers, accountants, contract managers, etc. The specific issues follow:

I. AUDITABLE CERTIFIED COST OR PRICING DATA REQUIREMENTS

A. The Competition Exemption

We had been told that the Navy Prime contract was to be awarded pursuant to the competition exemption from the requirement for cost or pricing data. The competitive exemption on the initial purchase was the only commercial contracting issue solved by the regulations. PCO's, however, do not seem to be able to administer this exemption, i.e., there is no certified piece of paper to put in the file for each part number. For example, Lockheed was awarded the Navy program and was not required to provide cost or pricing data. After we had withdrawn our bid, Lockheed asked if we would be willing to supply three of the systems we had bid that would not have to be modified. Lockheed needed to order a few systems to support the FSED part of the program. In spite of contract award pursuant to the competition exemption, the PCO stated that Lockheed would be required to obtain cost or pricing data or a SF1412 from us. It is also clear from the letter that the PCO did not understand that a SF1412 and a waiver are not the same. We would not have needed to ask for waiver of Government contracting requirements if we could have solved our problems with SF1412.

B. Limitations of the SF1412

In our experience with Government sales, PCO's uniformly believe that the only way they can purchase a commercial product is by putting a SF1412 in their file. Unfortunately, the SF1412 cannot often be used for our sales. For example, at this point it is impossible for us to comply with the SF1412's requirements for Lockheed's procurement of the three unmodified systems they still want to buy from us. Even though we do not have to modify these particular products for Lockheed, these are new systems recently introduced to the market. Therefore, these systems do not yet have a substantial sales history.

There will be a limited period of time when the products probably will qualify for sale using a SF1412, but at any point in time there is a risk we would be unable to use that form. Any of the following will prohibit us from selling to the Government if SF1412 is the only method for accomplishing the sale: sales based on catalog price fall below what can be considered "substantial"; sales to the Government exceed 45%; not a wide enough variety of commercial customers buy that specific part number; or, the commercial market stops buying that part and moves on to a different technology. For the supply of avionics which must be engineered at significant cost into aircraft systems, the SF1412 is an inadequate vehicle for assuring that the Government can obtain an uninterrupted supply of product.

1. Why SF1412 is inadequate for the LRAACA program

For the LRAACA program, 1412s would be insufficient at several stages of the Program. At the beginning of the program, any newly developed parts would not qualify. Throughout the program, parts modified to the aircraft application would be required to have unique part numbers for safety reasons and, therefore, would not qualify for exemption. Some of the parts that would not need to be modified are sold to only one other customer (Gulfstream) and, therefore, would not qualify. Aircraft production is scheduled to start in 1995, after or near the end of Gulfstream IV aircraft production; at that point, the majority of sales would have been to the Government. And, two years after substantial general public sales ended, the commercial contractor cannot use past commercial sales to qualify for exemption.

2. Direct purchase of spares by Government

All the above limitations would have made purchase of spares directly by the Government an impossibility for the LRAACA program. To avoid the issue, we stated in our proposal that we would sell spares for the Government to Lockheed at Lockheed's price. Lockheed said this was an issue between us and the Navy.

3. Air Force Example

One example of the application of the the restrictive rules of the SF1412 occurred recently when the Air Force tried to order, for a Foreign Military Sale, four parts that make up a particular weather radar system. Two of the four parts could not qualify for the 1412 exemption (enough customers but insufficient quantities). The PCO solved one problem by buying a smaller, less desirable display that could qualify for the exemption. A fourth part (an $1,807.00 flat plate antenna) required for system operation, has not yet been defined as it does not qualify for SF1412 exemption. We are the only supplier. The irony is that the Foreign Military customer could have purchased the part directly from us without a problem.

4. How much modification can be accepted?

Minor product modifications can be accepted at the discretion of the contracting officer (and the auditor). There is no real guidance for how much modification is too much. Lockheed chose to establish a guideline of 40% for this procurement.

5. Auditing standards are inconsistent

The final problem we face with the SF1412 is with inconsistent auditing standards. Some auditors will allow price justification based on catalog when a distribution of prices around catalog price is demonstrated. Others will deny any sales not exactly at catalog price. Some auditors will allow similar product sales histories to be used to justify the price to the Government. Others require strict sales history on only that detailed part number. The applicable rules are not defined at the time of bid soliciation.

C. NON-RECURRING CHARGES FOR CHANGES

Even if the initial contract awarded would have been accomplished under the competition exemption from the requirement for cost or pricing data, that would not have resolved many other commercial contracting issues. The most important single issue in this category is the requirement for certified auditable cost or pricing data for engineering changes and termination claims. Changes could not have been avoided on the LRAACA program. Avionics must be tailored to the aerodynamics and mission requirements of the aircraft and interfaced with the other systems on the aircraft. During the development phase, these items get refined. If the change is out of the scope of the job the contractor originally bid, then the contractor is due an equitable adjustment. Further, the Government has the right to unilaterally direct changes for any part purchased only by the Government. Auditable certified cost data must be supplied if the dollar threshold is reached.

Our accounting system is not CAS compliant. We do not employ accounting staff to host Government audits of our books. Once the right to audit has been granted, it is very difficult to limit an auditor's demands or contain the added cost of doing business that comes from additional reports and the infrastructure to support an audit.

In our LRAACA bid, we did not ask that our Change quotes be accepted at face value. We proposed the same substitute reasonableness/fact-finding procedure we offer for our major commercial contracts.

C. OPTION EXERCISE

The exemption based on competition does not grant any protection to the commercial contractor that firm option prices will be accepted by the PCO or auditors when the option exercise date arrives. The PCO has the right to require new cost or pricing data. We tried to address this issue by firm pricing the options including an escalation formula. We added a provision assuring Lockheed that if the formula yielded a higher price for any part sold to Lockheed than the catalog price for similar parts, we would lower the price to Lockheed to the catalog price. Our intention was to make sure that marketplace forces affecting even similar parts would continue to protect Lockheed and the Navy.

D. RISK TO OTHER DIVISIONS

Some of the products we were going to be selling to Lockheed include products built by other commercial divisions of Honeywell. If any of the requirements for auditable certified cost data flowed down to us, they would not have stopped with our division. Other commercial divisions would have been forced to comply or refuse to sell to us.

II. DATA RIGHTS

The regulations required Lockheed to obtain design data if any Navy funded non-recurring was paid. Designing the modifications to the avionics to fit the aircraft and its mission would require non-recurring investment. We were willing to invest some of our own money, but not to fund it all. Therefore, because some Navy funds would have been paid, we could lost rights to designs funded by us.

Data and training to be provided to the Navy was also an issue. Some of the requests were for data we consider proprietary and will not provide.

III. PROGRAM MANAGEMENT

In the course of our dealings with Lockheed, it eventually became clear that once the subcontract was awarded and performance began, there would be constant reference to FAR and DFAR provisions. We were going to be faced with explaining our position again and again whenever an issue arose regarding compliance with Government practice.

CONCLUSION

When we bid this program, we thought a "commercial contract" was one based on terms like the Uniform Commercial Code and other mutually acceptable conditions. Lockheed thought they could find enough exemptions in the FARs to be able to award the subcontract to us. We tried to find a way to accomplish acceptable solutions under the existing set of Government contracting regulations. Ultimately, there were just too many issues, too many risks, too much probability that this subcontract could force us into adopting Government contracting business practices. This eventually would drive us out of our primary served market. Even trying to set up a separate business entity - which is what all the experts recommended - did not adequately address interdivisional pricing issues and would have destroyed the economies of scale that incremental business brings.

We have hope that some of the problems we have experienced are being recognized and addressed. For example, the Air Force in the Tanker, Transport, Training System procurement, has taken some very promising steps toward resolving these issues before the actual Air Force RFP is issued. This is the result of much effort by both industry and the Air Force, but the issues are addressed on an exception basis. While we appreciate the Air Force's effort and willingness to work the issues, using a case-by-case approach is not the solution. Nor can these issues be addressed piecemeal by trying to amend each of the laws and regulations that prohibit or impede government procurement of commercial products.

RECOMMENDATION

For the benefit of both government and industry, we need laws that allow the Government to procure commercial products using commercial terms.

Thank you for allowing us to share this experience and our views with the committee. I would be pleased to answer any questions you may have.

Mr. LEWIS. Yes, sir, I will be glad to respond to that.

I look at the commercial acquisition problem really in two parts. One is that in regards to the purchase of commercial products—that is, an off-the-shelf commercial product that may meet military specifications or may not have a military specification requirement.

For instance, there is now a current $100,000 limitation where a certification must be signed that you have provided cost and pricing data for that, providing it meets some other things, that there was not adequate competition. That is, if they went to buy a specific piece of equipment.

It appears to me that a more appropriate level is $250,000 in today's environment. It was reduced to $100,000 because of concern with spare parts and other things. Cost certification data, which is terribly burdensome to commercial companies, is now required more frequently because of the reduction in the floor from $250,000 to $100,000.

I recommend for instance, that this level be raised to $500,000.

I am sure we can provide you with some information on some other instances like that.

Senator BINGAMAN. These are legislative?

Mr. LEWIS. Yes, sir.

Senator BINGAMAN. One legislative change that is needed?

Mr. LEWIS. Yes, sir. That is a legislative change that can be made. I have had the same discussion with Ms. Spector and brought this same issue to her. Her comment was that this was not something that the DOD can do because this is in the statutes at the moment.

The other aspect that I refer to as the use of commercial products or commercial manufacturing has to do with instances in which the Government does need a militarized or a specified product is unable to use a commercial product line that may be in effect in order to produce that particular product.

Years ago that was a requirement because of high quality needs or different quality needs. Today, commercial product lines are developing products that have exceedingly high quality and reliability. In other words, the quality and reliability of high-technology commercial products meets or exceeds Government requirements. They cannot be used however, because of the requirement for cost segregation.

As I pointed out in my summary, there, I think we have cost barriers. Now, how many of those are statutory and how many of those are regulatory? I guess I am not prepared to say just where the origins of all of that originate. We certainly can be prepared to provide that to you for the hearing record.

I believe there are two issues involved here. One is being able to use commercial product assembly lines. We recognize the need for additional testing or qualifications at the end to make sure that specifications are met.

For instance, semiconductors are a good example of where the lines must be kept segregated simply because of the cost-accounting methods. Yet, the quality coming off of the commercial lines is equally as good as required by the military.

Senator BINGAMAN. If you could be more precise about which of these concerns require legislative action, that would be very useful to us. As you know, we are approaching the time that we are going to mark up a defense bill. If people could call to our attention to the changes that are required in statute, we would be anxious to try to move ahead on some of those.

Mr. LEWIS. Yes. Rather than trying to recall those from memory let me submit them to your staff.

Senator BINGAMAN. I think that would be very useful. As you know, there is a lot of blame to go around in all the problems that we have with defense procurement. But I think there that too much time is spent by the administration saying Congress is the one that has caused this problem with the statute, and Congress saying the administration is the one that has caused this problem with the regulations. So, we need your good advice as to which one of us really can get it fixed.

Mr. LEWIS. Yes, sir. We are looking for the referee also.

Senator BINGAMAN. Okay.

[The information follows:]

ELECTRONIC INDUSTRIES ASSOCIATION
SUBMISSION FOR THE RECORD
OF HEARINGS BEFORE THE SENATE ARMED SERVICES SUBCOMMITTEE
ON DEFENSE INDUSTRY AND TECHNOLOGY
JUNE 2, 1989

Suggested Regulatory Changes for Subcommittee Consideration

A. Enclosure 2.A. is a February 13, 1989 letter to DoD which EIA signed as a member of the Council of Defense and Space Industry Associations (CODSIA). The letter offers a number of industry-proposed solutions to cost and pricing data problems experienced by commercial suppliers. Notwithstanding other proposals which may be pending at DoD, we believe this approach continues to represent the best and simplest reform package to deal with the variety of cost and pricing data issues.

B. Enclosure 2.B. is our letter to Deputy Under Secretary of Defense Robert McCormack, in which we suggest regulatory changes needed to remove impediments to commercial suppliers seeking to provide high tech products such as semiconductors to the government through cost-effective inter-divisional company transfers which currently are effectively precluded because of cost and pricing data requirements.

C. Enclosure 2.C. is CODSIA's September 30, 1987 submission to DoD's Assistant for Commercial Acquisition Greg Saunders as Mr. Saunders was preparing DoD's report to Congress on its efforts to implement the commercial products preference legislation of 1986. Unfortunately, most of the issues in this multi-industry letter remain unaddressed by DoD since the 1986 legislation became law. For this reason, we urge you to encourage DoD to adopt by regulatory change the recommendations set forth in the letter.

Enclosure 2.A.

COUNCIL OF DEFENSE AND SPACE INDUSTRY ASSOCIATIONS (CODSIA)

1722 Eye Street, N.W., Suite 300
WASHINGTON, D.C. 20006
•
(202) 457-8713

Mr. Duncan Holaday
Director
Defense Acquisition Regulatory Council
ASD (A&L) DASD(P) DARS
c/o 3E791, The Pentagon
Washington, DC 20301-3062

February 13, 1989
CODSIA Case 22-87

Dear Mr. Holaday:

The undersigned member associations of the Council of Defense and Space Industry Associations (CODSIA) would like to bring to your attention an issue of major importance to our member companies providing commercial (non-mil spec) products to the Department of Defense and other government agencies. The requirement for commercial product suppliers to provide certified cost or pricing data to the government has long been a major constraint on companies' willingness and ability to do business with the government.

We are herewith requesting establishment of a DAR case effort to examine specific policy changes which we believe will have a markedly positive effect by waiving the requirement for submission of cost or pricing data in appropriate instances. By reducing some of these unnecessary requirements, we believe the government will benefit from an enhanced ability to acquire new technology, and will see increased competition in the procurement process as more companies find themselves able and willing to compete for government contracts.

Enclosed for your consideration is a memo and attached rationale concerning the specific changes we would like the council to focus on as it considers changes in this area. While numerous other barriers must be overcome, we believe adoption of this proposal would be a positive first step toward accomplishing our mutual objective of increased commercial product procurement.

We appreciate your consideration of this proposal, and our representatives are available to meet with you to discuss it further should you or members of the council wish to do so.

Sincerely,

Don Fuqua
President
Aerospace Industies Assn.

Jean A Caffiaux

Jean A. Caffiaux
Senior Vice President
Electronic Industries Assn.

John L Pickitt

John L. Pickitt
President
Computer & Business Equipment
Manufacturers Assn.

J. Richard Iverson
President
American Electronics Assn.

Wallace H. Robinson, Jr.
President
National Security Industrial Assn.

Enclosure 2.B.

Electronic Industries Association

April 26, 1989

Mr. Robert C. McCormack
Deputy UnderSecretary for
Industrial & International Programs
Department of Defense
The Pentagon
Washington, DC 20301

Dear Mr. McCormack:

The Government Division of the Electronic Industries Association (EIA) supports the Semiconductor Industry Association's recommendations in their letter to you dated January 3, 1989. This letter addresses the Semiconductor Industry Association (SIA) issues by further clarifying recommended solutions and stating issues as they relate to government equipment contractors. We also believe our recommendations are consistent with, and will significantly advance, the DoD Acquisition Streamlining initiative.

A strong defense now and especially in the future requires American industry to be strong and remain competitive with global manufacturing, which is of special concern in the semiconductor industry. Congress and the Executive Branch have also expressed a strong preference for the use of competition in government procurement and to increase the commerciality of purchases.

However, the FAR implementation and administrative interpretation of requirements for submission of certified cost and pricing data fail to recognize the broader concept of competition in this context and are inconsistent with the economics of the U.S. semiconductor industry, upon which DoD relies to provide advanced technology. Significantly, projected DoD semiconductor sales for 1994 will drop to only 3.5 percent of the world market. Seven of the top 10 semiconductor companies in 1988 were non-USA; six of the remaining seven were Japanese. The change in the nature of this industry must be accommodated in the procurement process to sustain a critical national resource.

The following factors characterize the semiconductor and related microelectronics industry at this time:

1. **Competition on a global scale driven by very large commercial markets.**

2. **Rapid innovation, technology turnover and evolution of high-performance, application-specific devices, along with larger scale, faster multipurpose devices.**

3. Inherent high quality and reliability due to the nature of the product and manufacturing processes.

4. Competition with foreign and domestic commercial companies, using large integrated production facilities with little incentive to add significant extra costs for accounting data collection systems required to meet government certification criteria.

5. Competition among integrated technologies and families of compatible components rather than competition on a line item, part-by-part basis for given product applications.

6. Commercial purchasing practices which advantageously blend competitive bids with negotiation without a requirement for certified cost and pricing data, but are not accepted by government auditors.

7. Companies with predominately commercial business lines must separate DoD work because of the high cost of compliance and are slow to move the latest technology into this limited market segment.

8. Intracompany transfers between highly competitive advanced technology segments and the DoD market segments are effectively precluded. This generates more offshore dependence, forces companies to design out their own most advanced components and handicaps engineering solutions for new systems.

9. Future state of the art military designs will contain state of the art sole source microprocessor and microcomputer components. Future designs will also contain sole source application specific devices and other sole source semi-custom devices such as microprocessors that are factory programmable. As stated in SIA's letter, competing technologies can be price compared in the open market against a competitive technology, but not at the device-type level.

Following is a brief description of government procurement provisions which, we believe, require a practical redefinition and revision in our national interest. Specific recommendations are attached.

There is an inconsistency between FAR 31.205-26(e) and 15.804-3(b) in the definition of what constitutes adequate competition. FAR 31 requires that a competitive price is fair and reasonable only if it "results from an actual award" on that solicitation, in order to charge what would otherwise be allowable costs using FAR 15.804 "based on adequate competition" criteria. Also, FAR 15.804 allows Agency Head and Chief of Contracting Office waivers for the cost and pricing data requirement when the price is determined to be fair and reasonable, but DoD interprets that a waiver for 15.804 cost and pricing data does not waive FAR 31 allowability criteria. This contradiction effectively precludes use of intracompany transfers from separate business segments which predominately serve the highly competitive commercial semiconductor markets.

In material procurement, it is a common industry practice to obtain competitive bidding on package purchases, require single bids representing each supplier's best offer, and then source select the best overall value bid for further negotiation. Industry practices are to not auction the procurement process by asking for subsequent bids. Suppliers that expect auctions may not submit their best pricing in the first bid, waiting for further clarifications and expecting to gather information. Always requiring cost or pricing data to negotiate critically degrades the competition by limiting sources to only those who can provide cost or pricing data.

DoD's current practice of requiring cost or pricing data on Request for Proposals even on competitive procurements (firm fixed-price negotiated) forces primes and their subcontractors to supply and certify the data. To comply, U.S. semiconductor suppliers must segregate DoD processing and manufacturing from non-DoD. This isolation limits potential sources and also delays migration of advanced technology from commercial to DoD segments, even from sources that can provide cost or pricing data. Prime systems designers are forced to design only with suppliers and in technologies where cost and pricing data can be provided. Currently, as an example, the largest U.S. semiconductor supplier has not separated DoD manufacturing from commercial and subsequently refuses to accept business that will require submission of cost or pricing data. To establish a detailed Cost Accounting System to supply semiconductor product cost and pricing data to Public Law 87-653 standards would be harmful to the other 97 percent of their highly cost/technology competitive and strictly commercial operations.

We urge your support of the attached recommendations or, at a minimum, approval of a class deviation in these areas for semiconductor products. Representatives of our organization are available to meet with you or your staff if desired.

Sincerely,

Jean A. Caffiaux
Sr. Vice President
Government Division

Enclosures
/aa

MEMORANDUM FOR DIRECTOR, DAR COUNCIL

SUBJECT: Revision of FAR 15.804-3, Exemptions from Submission of Cost or Pricing Data

I. PROBLEM:

1. FAR 15.804-3(a) provides exemptions to the requirement for submission of cost or pricing data when it is determined that prices are based on adequate price competition, are based on established catalog/market prices of commercial items sold in substantial quantities to the general public, or are set by law or regulation. Newly introduced commercial products and discontinued commercial products will likely not meet the substantial quantities test for exemption from submission of certified cost or pricing data. Further, certain modular replacement assemblies of commercial products (e.g. circuit boards) required for stockpiling purposes by DoD, but generally not purchased by commercial customers, also may not meet the substantial quantities test. Additionally, commercial customers often buy maintenance and service contracts, resulting in sales of replacement parts being buried in repair orders and not easily traceable. Lastly, a substantive, competitive Government purchase of a commercial product can skew the substantial quantities test so that certified cost or pricing data may be required.

2. Most commercial vendors will not provide cost or pricing data on commercial products to the Government, or to any other customer, for several reasons:

A. incompatibility of commercial accounting systems with specific government requirements;

B. unreimbursed costs of collecting and providing such data;

C. administrative burden that requires additional paperwork and personnel training;

D. basic company policy that prohibits disclosure of cost data and pricing methodology.

3. Section 2306a of Title 10 U.S.C. requires offerors, contractors, and subcontractors to make cost or pricing data available on negotiated contracts over $100,000. Section 2306a(b) exempts offerors, contractors, and subcontractors from submitting cost or pricing data on negotiated contracts when the price agreed upon is based on adequate price competition or established catalog or market prices of commercial items sold in substantial quantities to the general public. The term substantial quantities" is not defined by statute but rather is defined in FAR 15.804-3(c)(4). Commercial vendors, faced with a solicitation requirement to provide cost or pricing data, must either provide the data or seek an exemption. Commercial vendors must enter into time consuming and costly negotiations with Government contracting officers or be precluded from competing and from remaining competitive.

II. RECOMMENDATIONS:

1. Amend FAR 15.804-3(c) to exempt newly introduced commercial products, discontinued commercial products that are being sold at established catalog prices, and low volume spare or replacement parts that are sold at established catalog prices from the requirement for submission of cost or pricing data.

2. Amend FAR 15.804-3(f)(2) to include in Category A only those sales by other than competitive procedures in the category of "Sales to the U.S. Government or to contractors for U.S. Government use" for purposes of determining an exemption from submission of cost or pricing data.

3. Amend instructions to offerors submitting claim for exemption from submission of cost or pricing data on Standard Form 1412 (Instruction 9) to read as follows (addition underlined):

> "Item 9. (a) Include in Category A all sales by other than competitive procedures of the catalog item (a) directly to the U.S. Government and its instrumentalities and (b) for U.S. Government use (sales directly to U.S. Government prime contractors, or their subcontractors or suppliers at any tier, for use as an end item, or as part of an end item, by the U.S. Government.

III. DISCUSSION:

1. Commercial vendors that do not submit cost or pricing data are prohibited from selling newly introduced commercial products, discontinued commercial products, and spare and replacement parts to the government that do not meet the substantial quantities test. Commercial products in these three categories likely will not meet the regulatory "substantial quantities" test for exemption from submission of certified cost or pricing data. FAR 15.804-3(c) defines "sold in substantial quantities" to mean "only when the quantities regularly sold are sufficient to constitute real commercial market". FAR 15.804-3(f) further

defines substantial sales to mean that at least 55 percent of the commercial product sales are to the general public at catalog or other prices and sales at catalog prices comprise at least 75 percent of all general public sales. The substantial quantities test is not met (FAR 15.804-3(f)(B)(2)(ii)) for commercial products where less than 35 percent of total sales are to the general public.

2. A substantive competitive government purchase of a commercial product can skew the "substantial quantities test" so that certified cost or pricing data may be required. Under current regulations, commercial vendors are penalized for competitive commercial product sales to the Government. Commercial vendors that do not submit cost or pricing data for commercial products and that sell a large number of commercial products to the Government, either though competitive or noncompetitive sales, may be precluded from selling products to the Government until sales to the general public surpass Government sales.

Attachments
1. Supporting Examples
2. Revised FAR 15.804-3(c) Language
3. Revised FAR 15.804-3(f) Language
4. Standard Form 1412

SUPPORTING EXAMPLES

NEWLY INTRODUCED COMMERCIAL PRODUCTS: In August 1986, an IFB (2-step bid sample) came out for a cable tester. After the technical evaluation (lst step), only one bidder was acceptable. The acceptable vendor offered a "B" model for evaluation which was the updated and replacement model for an older "A" model. In April 1987 an RFP was requested of the acceptable bidder (a commercial vendor) requiring a SF 1412. The commercial vendor, in May 1987, submitted a SF 1412 on the "A" model since the "B" model was too new to have a sales history. In June 1987 DoD requested cost and pricing data on the "B" model. In July 1987 the commercial vendor responded that the "B" model product was similar and a planned replacement for the "A" model. After three SF 1412 submissions and rejections, in April 1988 a SF 1412 was submitted, now based on actual commercial sales of the "B" model because the product had been on the market for 6 months, and was accepted.

DISCONTINUED COMMERCIAL PRODUCTS: Commercial vendor manufactured thermal printer driven by large computer. Technological capabilities changed and thermal printer became obsolete. Commercial customers moved to new technology while government continued to buy thermal printers for replacement purposes and to meet overall systems design specifications based on long lead times. Once commercial sales dropped below 35 percent, product no longer qualified for exemption from submission of certified cost or pricing data. Commercial vendor, unable to supply cost or pricing data, had to either seek a waiver or limit sales to contracts under $100,000.

SPARE AND REPLACEMENT PARTS:

EXAMPLE 1: Assemblies containing repairable components of commercial test equipment are not normally repaired by commercial users by replacing individual components. The commercial users usually buy maintenance and service contracts that result in sales of modular replacement units being buried in repair orders and consequently, not easily traceable. DoD relies on the use of modular replacement units where the entire circuit board is replaced in the field but then the defective board is sent to a depot for repair. Because the entire circuit board, although priced in a catalog, is rarely sold to commercial users, the circuit board does not meet regulatory definition of "substantial quantities".

EXAMPLE 2: Certain spare or replacement parts for commercial products have a design life that far exceeds the design life for the whole commercial product. As a result, commercial customers rarely purchase those parts. DoD, however, with unique stockpiling requirements will purchase significant quantities of those long design life spare parts. Because few commercial customers buy those spare parts, they do not meet the regulatory definition of "substantial quantities". As a result, cost or pricing data can be required.

SKEWING OF SUBSTANTIAL QUANTITIES TEST: Sales of commercial oscilloscope had traditionally been split 80 percent to the general public and 20 percent to the Government. A single buy by the Air Force of 8,000 units reversed the split in sales so that the product was no longer considered exempt from submission of cost or pricing data.

REVISED FAR 15.804-3(c) LANGUAGE

(c) Established catalog or market prices. A proposal is exempt from the requirement for submission of certified cost or pricing data if the prices are, or are based on, or for discontinued items were based on at the time of notice of discontinuance, established catalog or established market prices of commercial items sold in substantial quantities to the general public.

i. A proposal for a newly introduced commercial product is exempt from the requirements for submission of certified cost or pricing data if the prices are based on established catalog or established market prices for the newly introduced commercial product offered for sale to the general public.

ii. A proposal for spare or replacement parts for commercial items where the commercial items are offered for sale to the general public is exempt from the requirement for submission of certified cost or pricing data if an offeror submits a certificate of commercial pricing certifying to the best of the knowledge and belief of the offeror, the price proposed in the offer does not exceed the lowest commercial price at which the offeror sold such parts during the most recent regular period for which sales data are reasonably available. In order to qualify for this exemption, the terms of the proposed purchase, such as quantity and delivery requirements, should be sufficiently similar to those of the commercial sales that the catalog or market price will be fair and reasonable.

(1) "Established catalog prices" must be recorded in a form regularly maintained by the manufacturer or vendor. This form may be a catalog, price list, schedule, or other verifiable and established record. The record must (i) be published or otherwise available for customer inspection and (ii) state current or last sales price to a significant number of buyers constituting the general public (see subparagraph (4) below).

(2) "Established market prices" are current prices that (i) are established in the course of ordinary and usual trade between buyers and sellers free to bargain and (ii) can be substantiated by data from sources independent of the manufacturer or vendor.

(3) An item is "sold in substantial quantities" only when the quantities regularly sold are sufficient to constitute a real commercial market. Nominal quantities, such as models, samples, prototypes, or experimental units, do not meet this requirement.

For services to be sold in substantial quantities, they must be customarily provided by the offeror, using personnel regularly employed and equipment (if any is necessary) regularly maintained solely or principally to provide the services.

(4) The "general public" is a significant number of buyers other than the Government or affiliates of the offeror; the item involved must not be identified for Government end use. Any sale other than a direct sale to an instrumentality of the U.S. government for government use is a commercial sale.

(5) A price is "based on" a catalog or market price only if the item being purchased is sufficiently similar to the catalog- or market-priced commercial item to ensure that any difference in prices can be identified and justified without resort to cost or price analysis. For discontinued items, "based on" shall mean the last published or market price at which sales of the item were made to the general public, increased by an agreed-to annual price escalation factor that allows for increased manufacturing and inventory carrying charges.

(6) If an item is similar to a commercial item for which there is an established catalog or market price at which significant quantities are sold to the general public, but the price proposed is not based on this catalog or market price (see paragraph (5) above), the contracting officer may, if doing so will result in a fair and reasonable price, limit any requirement for cost or pricing data to those data that pertain to the differences between the items. When there is a difference between the catalog or market price and the proposed price to the government, the offeror shall bear the burden of establishing reasonableness of the incremental cost.

(7) "Commercial items" are supplies or services regularly used for other than Government purposes and sold or traded to the general public in the course of normal business operations. Or, in the case of a newly-introduced product, an item should be considered a commercial item if the commercial vendor offering that item is: in the commercial business of producing such type items on a regular basis, the new product is within the family of products sold commercially, the offeror has publicly announced the item as a new product line and is in production of such items.

(8) Even though there is an established catalog or market price of commercial items sold in significant quantities to the general public, the contracting officer may require cost or pricing data if (i) the contracting officer makes a written finding that the price is not reasonable, including the facts upon which the finding is based, and (ii) the finding is approved at a level above the contracting officer.

(9) (added) "Discontinued items' are items that are no longer supplied by the manufacturer or vendor to the commercial marketplace but are required by the Government. For such items, exemption from submission of cost or pricing data shall be determined by applying the criteria in (c) above to sales for the appropriate period immediately prior to the supplier's notice to the Government of intent to discontinue the item. The first favorable determination of commerciality shall be considered a class determination and shall apply to all additional purchases of the item, including any equivalent remanufactured items that may be substituted.

REVISED FAR 15.804.3(f) LANGUAGE

(f) Verification. (1) When a prospective contractor requests exemption from submission of certified cost or pricing data, the contracting officer shall ensure that applicable criteria in either paragraph (c) or (d) above, as appropriate, are satisfied before issuing the exemption.

(2) SF 1412 lists three categories of sales related to the established catalog price of a commercial item sold in significant quantities to the general public: A) Sales by other than competitive procedures to the U.S. Government or to contractors for U.S. Government use; B) Sales at catalog price to the general public; and C) Sales to the general public at other than catalog price. Although "significant quantities" cannot be precisely defined (see subparagraph (c)(3) above), the following guidelines are provided for determining whether exemption claims submitted under the catalog price provision of SF 1412 meet the "substantial quantities" criterion:

(4) (added) For vendors with GSA Multiple Award Schedule contracts, SF 1412s are not required for products where GSA has determined that such products are "commercial items", and such products are included in a Schedule contract which currently is in effect.

SPECIFIC RECOMMENDATIONS

A. Remove the inconsistencies between FAR 15.804 and FAR 31.205 by revising FAR 31.205-26(e)(2) from:

Is the result of "adequate price competition" in accordance with 15.804 and is the price at which an award was made to the affiliated organization after obtaining quotations on an equal basis from such organization and one or more outside sources that produce the item or its equivalent in significant quantity.

To:

Is based on "adequate price competition" or the certification of cost or pricing data is waived in accordance with 15.804-3.

B. Enable the use of widespread commercial negotiation practices based on competitive bids without a requirement for submission of certified cost or pricing data by adding the following text to 15.804-2(a)(iii):

However, if fixed priced competitive bids were solicited and received from two or more responsive, responsible offerors, the prime may make a source selection, based on price and other factors, and then further negotiate only with the selected source without a requirement for certified cost or pricing data, provided that negotiation does not result in a substantial difference from the lowest offered price, that the price remains lower than the next higher bid, and that negotiation does not substantively alter the quantity, quality or content of the original performance specified for competitive bid.

C. Eliminate the practice of requiring certified cost or pricing data for competitive firm fixed-price negotiated RFPs and contracts when two or more responsible, responsive offers are initially received and cost/price is a significant award criteria.

D. Enable the price comparison of functionally competitive products or families of products which may differ significantly in exact design and configuration by revising FAR 15.804-3(b)(3) from:

(3) A price is "based on" adequate price competition if it results directly from price competition or if price analysis alone clearly demonstrates that the proposed price is reasonable in comparison with current or recent prices for the same or substantially the same items purchased in comparable quantities, terms, and conditions under contracts that resulted from adequate price competition.

To:

(3) A price is "based on" adequate price competition if it results directly from price competition or if price analysis alone clearly demonstrates that the proposed price is fair and reasonable in comparison with current or recent prices for comparable items in comparable quantities, terms and conditions.

Enclosure 2.C.

COUNCIL OF DEFENSE AND SPACE INDUSTRY ASSOCIATIONS (CODSIA)

1620 Eye Street, N.W., Suite 1000
WASHINGTON, D.C. 20006
•
(202) 659-5013

Enclosure 2.C.

September 30, 1987
CODSIA Case 22-87

Mr. Greg Saunders
Assistant for Commercial Acquisition
OASD (P&L) PS/SDL
The Pentagon, Room 2A318
Washington, D.C. 20301-8000

Dear Mr. Saunders:

The undersigned member associations of the Council of Defense and Space Industry Associations (CODSIA) are pleased to provide comments regarding changes to the defense acquisition system necessary to enable DoD to buy more commercial products and nondevelopmental items.

As you are aware, Section 907 of the FY 1987 Defense Authorization Act states a preference for the acquisition of nondevelopmental items to fulfill DoD requirements. This legislation implemented a recommendation contained in the Final Report of the President's Blue Ribbon Commission on Defense Management. The legislation provides the framework upon which DoD can build a system to efficiently acquire high quality items from the commercial marketplace, or items which have previously been developed.

We urge DoD to focus its implementation of the Authorization Act on the acquisition of nondevelopmental items and not limit implementation to commercial, off-the-shelf items. We believe that there are significant savings that can be made with the broad implementation of the Act as envisioned by the Congress when the Act was drafted.

Attached are papers addressing different facets of the acquisition process which present problems in the procurement of nondevelopmental items. We have developed papers covering pricing issues; military standards and specifications; market research and analysis; DoD policies, procedures and directives; the definition of nondevelopmental items; rights in technical data; and FAR impediments. We are available to answer any questions you may have in your review of this response.

We look forward to working with you to successfully implement the requirements of the Public Law.

Sincerely,

Jean A. Caffiaux, Sr. Vice President
Electronic Industries Association

Don Fuqua, President
Aerospace Industries Association

Wallace H. Robinson, Jr., President
National Security Industrial Assn.

John Stocker, President
Shipbuilders Council of America

Oliver R. Smoot

Oliver Smoot, Acting President
Computer & Business Equipment
Manufacturers Assn.

J. Richard Iverson

J. Richard Iverson, President & Chief
Executive Officer

PRICING ISSUES

Introduction

Goverment contracts are priced either by reliance on the marketplace or by negotiation based on full disclosure of all data that might affect prices. The latter type, negotiated contracts based on certified cost and pricing data, may at first glance seem straightforward and may seem to be an approach that any business might reasonably comply with.

In practice, entering into a major negotiated contract based on certified cost and pricing data activates an extensive scheme of government regulation of the operation of the business that is completely incompatible with standard commercial practices.

Certifying cost and pricing data does not merely require disclosure of commercially sensitive details of one's business and subject one to potential criminal prosecution for failure to make a complete disclosure. It also invokes Cost Accounting Standards, which would require any commercial business to substantially modify its financial system. It invokes the cost allowability rules, involving additional certifications and additional overhead to monitor compliance with the detailed rules of allowability. It invokes weighted guidelines profit policy, which will dictate an initial markup well below the level customary in commercial practice. In the future, it may also invoke certifications that the business's cost estimating and inventory control systems comply with government standards.

Most businesses could not incur the additional overhead required to comply with all these requirements and remain competitive in today's international market. Furthermore, compliance with these requirements under circumstances where it is not necessary represents a net loss to the national economy since neither the company nor the government benefits from the production of unnecessary and often unused paper.

The government has other acceptable methods of assuring reasonable prices in virtually every circumstance involving commercial or non-developmental items. When competition exists the government should, but often does not, rely on it to assure a reasonable price. In other cases, a bona fide catalog or market price can be demonstrated.

The government's demonstrated reluctance to rely on these effective methods of assuring reasonable price and its willingness to burden American industry with extensive paperwork requirements constitutes one of the major impediments to the acquisition of nondevelopmental items. In addition to the economic cost associated with negotiated contracts based on cost data, i.e., "cost-based contracts," the imposition of the requirement for cost and pricing data is one that many commercial vendors understandably resist even at the risk of losing government business, thus limiting the sources from which the governmenta may seek reasonably priced, needed goods and services.

Requiring Cost and Pricing Data Where There is Adequate Competition

Although the regulation does not require submission of cost and pricing data if there is adequate competition, government contracting personnel appear to be requiring such submission as a means of insurance against subsequent criticism. Such caution is understandable in the present circumstances, but it results in major costs to contracts to generate data that is not used in pricing the contract and prevents some commercial vendors from bidding at all.

This situation does not seem to reflect a defect in the regulations, but the existence of serious disincentives to the exercise of reasonable business judgment by contracting personnel. Until these disincentives are removed by changes in policy in DoD IG and Congress, little can be done to significantly improve this situation. Endless exhortations to use good business sense cannot overcome the ever present threat to discipline or prosecute for an error in judgment.

Efforts to change contracting approaches that have developed over time and are reinforced by the present climate of micromanagement require a stronger approach than policy memoranda. We recommend strong direction to rely on competition when it exists and not get cost and pricing data when it is unnecessary be included in the FAR Part 15.

Overly Restrictive Interpretations of the Catalog or Market Price Exemption

Certified cost and pricing data is not required if the price is based on established catalog or market prices of commercial items sold in substantial quantities to the general public. Apparently from an understandable excess of caution and a preference for the bureaucratic safety of massive data submissions, contracting personnel are interpreting this exemption as narrowly as possible and in some cases unreasonably so.

One of the more ironic situations arises when the product in question initially met percentages set forth in the regulations (but not the statute) as guidelines for contracting officer determinations. The the government buys so much that the percentages are no longer right even though the commercial market remains the same size. In such cases, the exemption has not been permitted even though the product is still being sold in the same "substantial quantities" to the general public.

Another situation which conflicts with the Government's ability to utilize advanced technology products developed at private expense arises when that new commercial product is introduced. Even though the product may clearly be marketed to the general public through national advertising and the like, if there are not "substantial quantities" of sales, the govermnet cannot buy the product on the basis of this exemption. The government can't buy until it's an old commercial product.

Where the percentages of government and commercial sales are close to what the regulations will permit and there are variations year to year in sales, the contractor will get different results each year because of strict application of the percentages in the regulation. Thus the contractor can either submit cost or pricing data or must forego sales to the government--which, of course, would bring the percentages back to where the government can resume buying at some future time.

It is curious that competitive sales to government, in effect, actually count against a contractor as non-commercial sales even though presumably the prices of such sales are demonstrably reasonable, having been determined by market forces. Although this would require a regulatory change, it would seem reasonable to either put these sales in a different category, count them as sales to the general public (having been set by the market), or not count them at all.

Responsible submission of a DD Form 1412 requires substantial data collection of sales. This may be very difficult with respect to spares; most commercial businesses do not record information on individual spares sales. Requirements for justification of the exemption generally do not take into account what information might be reasonably available in the commercial context, but assume that all businesses maintain the kind of data that cost-based defense contractors are required to maintain.

Contractors are often required to submit DD Form 1412's even though their prices have been exhaustively justified through negotiation of a multiple award schedule with GSA. Since this submission is not a trivial exercise in today's environment, this unnecessary effort only adds to the overhead of commercial business and detracts from our national competitiveness without benefiting the govrnment in any way.

Another restrictive interpretation is to limit the 1412 to the particular model number or, in the case of services, to the particular contractor location. In many cases, this produces percentages that cause the contracting personnel to reject the 1412. For example, the government is often the only customer that still maintains certain systems in use. Thus the spares for that system may not have been sold to any other customer for several years. Even though the spares are exactly the same or similar to other spares that are sold to commercial customers, they usually would have different model numbers. If 1412's are filled out only for that model number, and thus rejected, the contractor will be unable to sell on a commercial basis even, as in some actual cases, if his government business is less than one percent overall.

Another restrictive interpretation encountered is treating sales above list price as Category C sales. This makes it more difficult to establish the exemption even though the presumed purpose of the category C sales is to determine how much discounting from list price is going on. Generally the rationale for category C ignores the reality of most commercial markets that prices are set by competition and by price lists.

Even though the exemption clearly applies to services as well as to supplies. there is a general tendency to reject all but the simplest and most mundane services as commercial products. Thus the government is incapable of obtaining many engineering services, for which there are market as well as catalog prices, on other than a cost basis. Some contractors are forced to set up separate organizations to provide such services to the government at demonstrably higher costs to the government.

Also in looking at prior sales when reviewing a proposed commercial hourly rate for services, the government will take lump sum contracts and back out an hourly rate that might be completely inappropriate. The appropriate prior sales are those on a time and material basis. Fixed price contracts always involve more than mere hours and are usually set competitively.

The problems discussed above can be solved by revisions to FAR Section 15.804-3. These revisions would be completely within the letter and spirit of the Truth in Negotiations Act but are necessary in today's environment if the Government expects to successful explicit existing market forces to assure reasonable prices for its goods and services. We recommend that DoD immediately initiate a FAR case to consider such revisions. Industry would be pleased to work with the DAR Council to develop specific language.

Most Favored Customer Clauses and Commercial Pricing Certificate

These provisions require any potential contractor to be able to track all of its sales, prices, and terms and conditions. Such a system is costly for a large company and probably impossible for a small company. Thanks to tremendous efforts by many individuals and organizations, the statutory provision does provide various limitations that reduce the impact on a business.

Other such clauses, like the unauthorized Navy clause "Most Favored Customer Assurance," are so open ended and poorly defined that contractor acceptance must result in either risk of criminal prosecution or incurring massive recordkeeping costs.

All of these provisions, however, impose recordkeeping requirements well in excess of anything needed in commercial practice. The Government must learn to rely more on the marketplace if it is to take advantage of existing commercial products. An additional factor is that the Government often insists on a price given to buyers that requires much less in the way of after sale service such as original equipment manufacturers and distributors. We would suggest that the Government should be more concerned about a fair price than the lowest price.

All of the "Most Favored Customer" clauses should be reviewed under Paperwork Reduction Act procedures and alternative approaches that balance the Government's interest in fair prices and the additional recordkeeping expense on commercial businesses should be considered. One such approach might be the use of a clause like "Economic Price Adjustment--Standard Supplies" (FAR 52.216-2).

MILITARY STANDARDS AND SPECIFICATIONS

Military standards and specifications define extreme conditions and requirements to provide for the worst case and have been developed as a "guide" to the development and production of military equipment. The U.S. Government often levies these requirements on all products, regardless of their intended use or the environment in which they must operate. In numerous instances the Government may have denied itself truly current technology and suffered a cost penalty as a result of its requirements to "militarize" commercial products before their use in Government procurements. The increased use of commercial practices and products would go a long way toward improving quality and reducing costs.

In accordance with current DoD policy, specifications must be further tailored to permit the acquisition of commercial items. Coupled with this action there must be close scrutinizing (streamlining) of the inspection/acceptance criteria for conformance with that in the commercial marketplace without the elaborate requirements sometimes imposed by DoD. The Government should implement the process of using commercial grade parts by requiring military specification requirements only for critical hardware and unproven parts.

Through a prior selection and identification process of critical system elements, the Government can continue to assure high reliability of these critical system elements and at the same time achieve a cost advantage in commercial grade parts on non-critical elements.

Experience has taught us that mature commercial parts normally attain many of the reliability goals that military part specifications try to assure. Military specification requirements should be applied to unproven parts. Once parts have a proven record, these parts should be relieved of the military requirements. Establishing commercial preferred parts, qualification criteria and preferred status on commercial parts by each military supplier, will be the first step in lowering the cost of military products through the use of commercial parts.

Probably the most significant impairment of the DoD's ability to give preference to the acquisition ot commercial products is Section 10.006(a) of the Federal Acquisition Regulation which specifies that use of specifications is "mandatory" unless (1) otherwise authorized by law, (2) "deviations" from their use are approved under the procedures set forth in FAR 10.007; or (3) one of the five exceptions set forth in FAR 10.0006(a) applies. Deviation is permitted only if any existing specification does not meet the agencies' "minimum needs." The regulation speaks of commercial procurement as an "exception" to the rule of using mandatory specification. In order to carry out the intentions and directions of the 99th Congress, the FAR must be revised to make mandatory the use of commercial products and procurement and provide for the use of miltiary specifications and standards as exceptions or deviations only. DoD requirements should be specified in broad functional terms rather than with rigid specifications.

MARKET RESEARCH AND ANALYSIS

The FY 1987 Defense Authorization Act contains a provision in Section 907 entitled "Preference for Nondevelopmental Items". This provision requires that the Secretary of Defense shall ensure that to the maximum extent practicable:

"(1) requirements of the Department of Defense with respect to procurement of supplies are stated in terms of -

(A) functions to be performed;
(B) performance required; or
(C) essential physical characteristics;

(2) such requirements are defined so that nondevelopmental items may be procured to fulfill such requirements; and

(3) such requirements are fulfilled through the procurement of nondevelopmental items."

The above legislation clearly states Congressional intent that nondevelopmental items be procured by the Department of Defense in preference to the development of new products. The legislation indicates Congressional concurrence with the Packard Commission recommendation regarding the expansion of the use of commercial products. The Packard Commission recommended that DoD "should develop new or custom made items only when it has been established that those readily available are clearly inadequate to meet military requirements." In order to implement the legislation and the Packard Commission recommendation, the Department of Defense will have to dramatically revise procurement strategies to meet acquisition requirements.

The implementation of Section 907 requires that the Department of Defense's approach to the acquisition process be modified at its earliest stages. As soon as a requirement is identified, the requirement must be viewed with the perspective of identifying an available, nondevelopmental item that can fulfill the requirement with or without modifications. This approach will necessitate that the essential features of the required product be clearly identified. At that point market research should be performed by the Department of Defense to establish nondevelopmental items that could satisfy the needs of the requiring agency. Evaluation should not be limited to commercial items already in or currently being acquired into inventory. Rather, market research should consider options of modifying existing products regardless of their sources. If an existing commercial or nondevelopmental item can meet the requirement with modifications then the acquisition of that existing item should be given preference to the development of a new item.

In terms of regulations, Federal Acquisition Regulation (FAR) Part 11 needs to be rewritten to incorporate the requirements of Section 907 of the FY 1987 Defense Authorization Act. Part 11 needs to be expanded to cover not just commercial products but nondevelopmental items. The definition section should be broadened to include the definition of nondevelopmental items which is contained in paragraph (d) of Section 907. Part 11 must also state in the policy section that there is a clear preference for the acquisition of nondevelopmental items in meeting military requirements. In addition, the recommendations of the Packard Commission contained in the Final Report to the President and in Appendix H to the report should be incorporated into Part 11. In particular, the recommendation that requires justification for not using nondevelopmental items should be made part of the permanent regulatory policy. Also, the market research and analysis section should be expanded to consider all types and sources of nondevelopmental items.

DOD POLICIES, DIRECTIVES AND INSTRUCTIONS THAT NEED REVISION TO PROMOTE BROADER USE OF COMMERCIAL AND OTHER NONDEVELOPMENTAL ITEMS

DoDD 5000.1, "Major and Non-Major Defense Acquisition Programs," should reference a DoDD on "Use of Commercial and Other Nondevelopmental Items," and section D.9 f should be revised to read:

> "Emphasis should be given to maximizing the use of commercial and nondevelopmental products, services and practices; including nonorganic (industry) sources for depot-level maintenance and repair and for training."

DoDD 5000.2, "Defense Acquisition Program Procedures," should require an affirmative plan for broadest practical use of commercial and other developmental items to be reviewed at Milestone 0 as one of the primary considerations under D.1.b. Implementation of this plan should be reviewed as part of the "primary considerations" under each subsequent Milestone.

Each and every other DoD Directive is a candidate for some application of the emphasis on the requirement for commercial and nondevelopmental item use. We would be pleased to provide specific changes appropriate to each of them but response time does not allow it at this time. The Policy and Initiatives Committee and the Production and Logistics Committee of the Defense Acquisition Board might be the principal advocates and enforcers of the subject.

THE DEFINITION OF NON-DEVELOPMENTAL ITEMS (NDI)

In an effort to facilitate increased economy and efficiency in the acquisition of essential material and services for the Department of Defense, the Congress enacted into law a legislative preference. That preference exhorted the Department of Defense to acquire, whenever and wherever practicable, commercial products or existing items (non-developmental items) in lieu of new items uniquely developed or manufactured to designated Government specifications.

The potential benefits identified by the Congress associated with this preference were:

1. Avoidance of developmental costs.
2. Reduction of procurement leadtime.
3. The economies of scale.
4. Reduced costs of ownership because of the availability and cost of spare parts.
5. Reduction in overall risk.
6. Contract simplification.
7. Enhanced competition.
8. Expanded but appropriate use of fixed price type contracts.
9. Facilitization of the use of Planned Product Improvement to meet ultimate or optimum Government requirements.

The unique aspect of this direction is that it was uniformly endorsed as an acquisition reform both by industry and the Government. However, while conceptually sound, it has been flawed in implementation. Current practices being employed by components of the Department of Defense are defeating accomplishment of the legislative intent and denying the acquisition process a viable tool to improve the economy and efficiency of its management.

There are numerous instances where procurements have been characterized as NDI acquisitions only to require, as part of the bid and proposal process, substantial investment in development, testing, tooling, and facilitization in order to meet excessive program requirements. When conducted correctly, NDI should result in the

Government's selection of an existing item which, by either evaluation or testing, demonstrates the potential to meet the user's optimum requirement with a minimum of subsequent development, cost, schedule, or technical risk. Utilizing whatever criteria for selection that are deemed appropriate, the contract should be awarded to that contractor having the hardware which reflect the best value.

In practice, however, we find that the acquiring activities are demanding that Bid & Proposal Costs (pre-contract effort) be expended to develop existing hardware before selection into a variant which can initially meet the specified requirement or some intermediate variation thereof. This is simply not NDI procurement but the normal development of new systems with the cost of development being borne by the contractor prior to contract award.

It does not reduce the cost of such hardware, but merely shifts the source of the funding required for development. By upping the stakes for proposing to the Government, it has the unintended effect of actually inhibiting increased competition, and shifts unreasonable risk onto industry because there is no assurance that these pre-contract investment costs will ever be recouped in whole or in part. Moreover, rather than development costs being borne by one contractor, they are now born by all the prospective contractors... making the total costs incurred for development markedly greater and dissipating finite resources in redundant effort.

We think the emerging problems need no legislative action, but through the oversight authority of the Congress only insistance that the DoD Acquisition Executive exercise his authority and responsibility to promulgate appropriate regulations to insure uniform implementation consistent with the legislative intent of the Congress. In this regard, the following are identified as the essential elements of any intended coverage to the DoD FAR Supplement:

1. An NDI procurement should be expressly defined as one in which the Government is soliciting proposals for:
   - An existing item;
   - That proposal evaluation and source selection will be based upon the degree to which the selected item best meets the Government's needs;
   - The Government's needs should be articulated as the item which, in its present configuration and without further development, offers the greatest potential to achieve the stated requirements with a minimum of technical, cost, schedule, or performance risk.
2. Contractor funding or pre-contract development effort to optimize the performance of the proferred item should not be encouraged or required in the solicitation.
3. The Government's performance requirements should be stated as a baseline against which the offeror's proposal will be evaluated and/or the hardware offered tested, but should not be a requirement going to contractor responsiveness.
4. Any modifications made to the proferred hardware at the prospective contractor's initiative before submission of proposals or contract award will not be evaluated if they address essential performance characteristics.

In summary, it is the desire of industry to ensure that appropriate implementing regulations are drafted by the DoD to ensure uniform policy consistent with the express intent of the Congress. The guidance for the drafting of such regulations, as offered above, is intended to ensure against:

- The inhibition of effective or enhanced competition by exclusion of prospective offerors unable or unwilling to subsidize in the proposal phase that special development effort required to meet optimum performance requirements of the customer.

- Protection against the transference to industry of the cost of research and development of prospective acquisitions without assurance of a subsequent contract award or indemnification of their investment if the program is cancelled.

- The prolongation of the solicitation and proposal evaluation phase of an acquisition because of redundant, expanding, and/or revised testing requirements mandating the utilization of B&P costs to fund what is more properly research and development effort specifically related to a distinct product.

- Loss of credibility of an acquisition methodology which offers a real and near term potential to reduce acquisition leadtime, the time required to field new systems, enhance competition, simplify the acquisition process, streamline contracts and specification requirements, economize the use of finite IR&D/B&P resources, avoid duplication of effort, and reduce the technical risk of meeting operational requirements with affordable hardware.

RIGHTS IN TECHNICAL DATA

The requirements imposed by the government in the area of technical data continue to cause considerable concerns to industry. Many of these concerns flow over to commercial product procurements, particularly where the commercial product is modified to meet a government requirement.

In view of the requirements for reprocurement packages, spare part support, maintenance, training, etc., government procurement personnel are seeking unlimited rights in products which have been developed at private expense.

Industry invests significant resources in developing processes and products in order to gain a competitive advantage in the marketplace. To require contractors to disclose their proprietary information for second source manufacture can have a significant effect on a contractor's investment in developing new products and processes.

In such cases a contractor must risk release of technical data essential to its competitive position in the commercial marketplace or must refrain from bidding in order to protect its position. The latter approach is detrimental to the government's desire for increased competition, results in increased costs to the government, and in the long haul results in reduction of the defense industry base and the loss of opportunity for the Government to acquire the most advanced state-of-the-art commercial products.

Another area of concern is that of computer software independently developed by a contractor for sale in the commercial marketplace. The government is seeking the right to duplicate such software. Further, in order to modify or maintain such software, it has sought access to the "source" code used to create such software. This code is understandably highly proprietary to the developmental contractor, and as such the contractor's rights should be protected.

Additionally, the government seeks other technical data, e.g., training aids and operational and maintenance manuals developed at private expense for the commercial market. Industry's current practice is to convey no rights, limited or otherwise, to standard commercial documentation, manuals and technical commercial information developed and paid for at the contractor's private expense. Such copyrighted materials should be governed by appropriate copyright provisions.

Over the last two years legislative and regulatory action have attempted to clarify the handling of technical data with respect to mil-spec equipment with considerable debate over who has rights to what. OFPP is currently developing new regulations in this area which, hopefully, will further clarify contractor/government rights to such data.

However, because of the government's past record in this area, serious concerns remain that the government will continue to require the release of or access to sensitive technical data on commercial products and will inadvertently release such data when it is provided under a "limited use" restriction.

In view of industry's continued concern with the current handling of technical data, it is recommended that current legislation as well as current and proposed regulations be reexamined with the intent of incorporating standard commercial practices.

FAR IMPEDIMENTS TO BROADER USE OF COMMERCIAL AND OTHER NONDEVELOPMENTAL ITEMS

One of the major constraints to the use of commercial items is the attainment of numerous socio-economic policies unrelated to the acquisition of the item in question. These provisions discourage commercial firms which would otherwise sell to the Government from offering their products and in turn DoD contracting officers are precluded from buying from commercial sources which cannot or will not conform to these provisions.

Among the major difficulties commercial vendors have with compliance in this area is that lead time requirements will often precede the Government's attempt to procure the commercial item. This means that commercial materials, components or systems are either purchased or fabricated on standard commercial terms to meet long-term projected commercial sales requirements well in advance of the Government solicitation. The commercial vendor therefore has no ability to manufacture or procure the materials, components or systems on the basis of Government-peculiar terms.

We make the following recommendations:

- Amend acquisition regulations and statutes so as to distinguish among requirements for contracts for Government unique products and requirements for commercial products and other nondevelopmental items;
- Amend statutes and regulations to provide that the standard commercial terms and conditions of prime and subcontractors regularly engaged in the sale of commercial products shall apply to the procurement of commercial products and other nondevelopmental items;
- Develop a uniform Government contract that relies upon standard commercial terms and conditions;
- Amend FAR to require early consideration of commercial products and other nondevelopmental items when an acquisition plan is being developed;
- Amend FAR to increase the emphasis placed on proper utilization of commercial products and other nondevelopmental items;
- Amend FAR to provide explicit regulatory guidance for Government contract personnel in the acquisition of commercial products;
- Allow contracting officers to accept commercial product replacement items that comply with fit, form and function contract requirements without the issuance of a contract modification when no substantial change has occurred;
- Prepare a comprehensive training program and appropriate materials covering the techniques and procedures for the procurement of commercial products for use by contracting officers, program managers, and technical personnel.

Attached is a tabulation of FAR provisions that warrant waiver in order to allow or promote borader use of commercial and other nondevelopmental items. The table identifies some items as not requiring waivers, from the perspective of a major prime defense contractor, but which might require waivers for other contractors and subcontractors.

		Flow Down Req'd?	Statutory	Commercial Product Waiver Req'd?		USC/Exec. Ord Reference	Waiver Req'd	Waiver Authority	Clause Rewrite Req'd?
				Prime K	Sub K				
52.203-1	Officials Not to Benefit	No	Yes	-	-	41USCSS22	No	-	No
52.203-3	Gratuities	No	Yes	-	-	10USCSS2207	No	-	-
52.203-5	Covenant Against Contingent Fees	No	Yes	-	-	10USCSS2306(b)	No	-	-
52.204-2	Security Requirements	Yes - if S/C Accesses Classified Info	Yes (Exec. Order)	-	-	41USCSS254(a) Exec. Ord. 10865 (2-20-60)	No	-	-
52.212-8	Priorities, Allocations & Allotments	Yes	Yes	Yes	Yes	50USCApp2061etseq 15CFR 330-354	Yes	None	Yes
52.215-1	Examination of Records by Compt. General	Yes - if over 10K	Yes	Yes		10USCSS2313(b) 41USCSS254(c)	Yes	None	Yes
52.215-2	Audit - Negotiation	Yes - if over 10K	Yes	Yes	Yes	10USCSS2306(f)(5) 41USCSS254(d)(3)	Yes	None	Yes
52.215-22	Price Reduction for Defective Cost or Pricing Data	Yes - if over 100K	Yes	Yes	Yes	10USCSS2306(f)	Yes	Agency Head	Yes
52.215-24	Subcontractor Cost or Pricing Data	Yes - if over 100K	Yes	Yes	Yes	10USCSS2306(f)	Yes	Agency Head	Yes
52.219-8	Utilization of Small Business Concerns & Small Disadvantaged Business Concerns	Yes	Yes	Yes	Yes	15USCSS631 et seq	Yes	None	Yes

* Unless the FCO is authorized to purchase "in the open market"

** 41CFR50-201-2 lists exclusions

		Flow Down Req'd?	Statutory	Commercial Product Waiver Req'd? Prime K	Sub K	USC/Exec. Ord Reference	Waiver Req'd	Waiver Authority	Clause Rewrite Req'd?
2.219-9	Small Business & Small Disadvantaged Business Subcontracting Plan	Yes - if over 500K	Yes	Yes	Yes	15USCSS631 *et seq* SBA 13CFRSS125.4(c) & 125.9	Yes	None	Yes
2.219-13	Utilization of Women-Owned Small Business	No	Yes (Exec. Order)	Yes	-	Exec. Ord. 12138 (5-18-79)	Yes	None	Yes
2.220-3	Utilization of Labor Surplus Area Concerns	Yes	Yes	Yes	-	15USCSS644(d), (e) & (f)	Yes	None	Yes
2.220-4	Labor Surplus Area Subcontracting Program	Yes - if over 500K	Yes	-	Yes*	15USCSS644(d), (e) & (f)	Yes	None	Yes
2.222-20	Walsh-Healey Public Contracts Act	Yes	Yes	-	Yes*	41USCSS35-45 Dol 41CFRSS50 **	Yes	None*	Yes
2.222-26	Equal Opportunity	Yes - if over 10K	Yes (Exec. Order)	No	-	Exec. Ord. 11246 (1965) Dol 41CFRSS60-1.1 *et seq*	Yes	Agency Head & Director of OCP	Yes
2.222-35	Affirmative Action for Special Disabled and Vietnam Era Veterans	Yes	Yes	Yes	Yes	38USCSS2012 Dol 41CFRSS60-250	Yes	Agency Head & Director of OCP	Yes

Unless the PCO is authorized to purchase "in the open market"

41CFR50-201-2 lists exclusions

		Flow Down Req'd?	Statutory	Commercial Product Waiver Req'd? Prime K	Commercial Product Waiver Req'd? Sub K	USC/Exec. Ord Reference	Waiver Req'd	Waiver Authority	Clause Rewrite Req'd?
52.222-36	Affirmative Action for Handicapped Workers	Yes - if S/C exceeds $2500.00	Yes	Yes	Yes	29USCSS793 Dol41CFRSSS60-741	Yes	President, Agency Head & Director of OCP	Yes
52.223-1, -2	Clean Air and Water	Yes	Yes	-	Yes	42USCSS7401 etseq	Yes	Agency Head	Yes
52.230-3	Cost Accounting Standards	*	Yes	*	*	50USCApp2168 4CFR331 et seq	No	-	-
52.230-4	Administration of Cost Accounting Standards	*	Yes	*	*	50USCApp2168 4CFR331 et seq	No	-	-
52.232-23	Assignment of Clauses	No	Yes	-	-	31USCSS203 41USCSS15	No	-	-
52.233-1	Disputes	No	Yes	-	-	41USCSS601 et seq	No	-	-
52.225-7009	Preference for Certain Domestic Commodities	Yes	Yes	Yes	Yes	P.L. 99-190, Sec. 8016	Yes	None	Yes
52.225-7011	Preference for Domestic Specialty Metals	Yes	Yes	Yes	Yes	P.L. 99-190, Sec. 8016	Yes	AC Contract Exempted	Yes
52.233-7000	Certification of Request for Adjustment on Relief Exceeding $100,000	Yes**	No Govt. Policy	Yes	Yes	P.L. 95-485, Sec. 813 P.L. 85-804	No	-	-
52.208-1	Required Sources for Jewel Bearings and Related Items	Yes**	No Govt. Policy	Yes	Yes	Procuring Agency Determination	Yes	PCO	Yes

* Does not apply if price is based on established catalog or market price.
** Unless it is determined the item being procured does not contain

		Flow Down Req'd?	Statutory	Commercial Product Waiver Req'd? Prime K	Sub K	USC/Exec. Ord Reference	Waiver Req'd	Waiver Authority	Clause Rewrite Req'd?
52.208-7000	Required Sources for Miniature and Instrument Ball Bearings	Yes**	No Govt. Policy	Yes	Yes	DOD Determination	Yes	PCO	Yes
52.208-7001	Required Sources for Precision Components for Mechanical Time Devices	Yes**	No Govt. Policy	Yes	Yes	DOD Determination	Yes	PCO	Yes
52.208-7002	Required Sources for High Priority Silicon	Yes**	No Govt. Policy	Yes	Yes	DOD Determination	Yes	PCO	Yes
52.208 7003	Required Sources for High Carbon Ferrochrome	Yes**	No Govt. Policy	Yes	Yes	DOD Determination	Yes	PCO	Yes
52.225-7001	Buy American Act and Balance of Payments Program	No	Yes	-	-	41USCSS10	No	-	-
52.227-10	Filing of Patent Application - Classified Subject Matter	Yes	Yes	-	Yes	35USCSS181-188	Yes	None	Yes
52.225-7011	Preference for Domestic Specialty Metals		Yes	Yes	Yes		Yes	None	Yes
52.225-7013	Preference for Domestic Hand or Measuring Tools		Yes	Yes	Yes	P.L. 97-377	Yes	None	Yes
52.247-63	Preference for U.S. Flag Air Carriers		Yes	Yes	Yes	49USC1517	Yes	None	Yes

* Does not apply if price is based on established catalog or market price.
** Unless it is determined the item being procured does not contain

H/7 - Vigal/List

SECTION 808

Senator BINGAMAN. In last year's defense bill, section 808 of that bill, we provided for a defense advisory panel on Government/Industry Relations to be established. You referred to that, I believe, in your testimony, Mr. Lewis.

Mr. LEWIS. Yes.

Senator BINGAMAN. DAPGIR is the acronym for that. Could you tell me how well that is working or, in your view, is expected to work. Is this going to be a useful thing or is this just another panel that is established and does not accomplish anything?

Mr. LEWIS. Well, let me give you a brief status of where that panel sits now, and I believe we will have to look at the outcome before issuing a final judgment. It is my understanding that the panel is nearing completion of the data required in preparation for writing the report to the Secretary of Defense on the three statutory tasks.

They included procedures governing suspension and debarment of contractors and the role of self-governance programs established by DOD contractors and alternative dispute resolution procedures and the advisability of establishing a permanent advisory panel on Government/Industry Relations.

This panel is expected to submit its report sometime in September of this year. My understanding, certainly from those topics and those issues, is that those are very critical issues that are being looked at and examined by the panel. As always, I think the work product of the panel must be known before an evaluation of its merits can be meaningful. At this point, I believe it is a useful forum for addressing these particular issues and I am looking forward—I would hope you would be too—to the output of that panel in September.

Senator BINGAMAN. Well, I do hope that the panel can play a useful role. That was the idea of it.

Mr. LEWIS. Yes, sir.

Senator BINGAMAN. In a lot of these issues there does not seem to be enough communication between industry and the Department on ways to improve the process. Maybe this will help.

SELF-GOVERNING INITIATIVES

Mr. Menaker, let me ask on your Initiatives—your self-governing Initiatives that industry has set up—how is the Congress, the administration, or anybody viewing it from the outside going to know whether this is effective, whether this is actually accomplishing something?

You have 47 companies that have now signed on to your Initiatives. Is there going to be any kind of assessment, not just whether they are going through the steps, but whether in fact there is less of a problem of unethical conduct among those companies that are participating? Is that an unrealistic thing to look for? How are we going to know if this is working?

Mr. MENAKER. I do not think it is unrealistic to ask that question at all. It is a very difficult one to answer, as I am sure you know.

Testing for effectiveness in an area of this type is far more complex than it is if you are testing in the financial area which, for example, an outside auditor is much more capable of doing.

However, we have seen some evidence already of the effectiveness of these programs. We see it through responses that we hear from people like William Reed, the head of the Defense Contract Audit Agency (DCAA), who has commented publicly that he believes and has seen evidence that companies that are participating in the DII effort are companies that the DCAA feels are more committed to the kinds of things they are trying to do. They have goals that are consistent with the CRAG, the Contract Risk Assessment Guide, which the DCAA is promoting very actively at this point in time.

So, when we hear comments like that from those kinds of people who are very much involved in oversight, in the oversight process, we find it quite encouraging.

The longer range results will take more time, and I would suggest that we need at least 3 to 5 years to determine whether or not in fact employees are responding to the kinds of programs that they are being asked to respond to.

Senator BINGAMAN. Again, I think the Congress—just speaking for myself—would like to be very supportive of this effort. I think it is a good initiative. But unless there is some way to point to some positive results, rather than just the steps themselves——

Mr. MENAKER. Yes.

Senator BINGAMAN [continuing]. It is going to be very difficult to put a lot of faith in it. I do not know exactly how we are going to measure that, but people are obviously very suspicious of the whole idea that the defense industry should be given the job of governing itself, with all of the allegations of scandal which have been in the news during recent years.

Mr. MENAKER. The DII effort itself is not designed to be a self-governance effort of the companies that participate in it. It is not a substitute for government oversight. We need government oversight. We are going to have government oversight. We need it to be professional oversight, and that is something also that we can also comment on at some point.

The DII effort is designed more to get companies committed to developing these programs. We can show you a great deal of evidence of very sophisticated programs that are now being implemented in these companies and others I am sure. We know that it is not just 48 companies that are involved in ethics codes, training, feedback, ombudsmen processes, and that sort of thing. There are hundreds of companies out there that are now trying to do the same thing.

We can show you and your staff in great detail the kinds of things that are being implemented in these companies. It is impressive.

COST AUCTIONING AND TECHNICAL LEVELING

Senator BINGAMAN. Mr. Odeen, you talk in your testimony about cost auctioning and technical leveling. Maybe you could just elaborate a little bit on what you mean by cost auctioning. How does that work?

Mr. **Odeen**. Certainly, Mr. Chairman. This really gets into the BAFO problem which I know you have looked at carefully.

The problem arises in cases where you have a complex technical requirement and a number of different companies responding. Some of the companies will come in with very sophisticated, thoughtful and innovative solutions to the Government's problem. Others will submit far less substantive proposals, but they may be a much lower cost provider. They will propose less competent, less experienced, less well-trained people.

When you have a series of discussions that continue over a long period of time between the contracting officer and the proposers, it is inevitable that much information will be revealed, either directly or indirectly, through the kinds of questions that are asked. The bidders who have submitted the less sophisticated and less innovative proposals will pick up clues and ideas that enable them to go back and adjust their proposal to make it as sound, and as technically competent and technically solid as the one from the higher quality proposer. This is called "technical leveling" in the trade.

In many cases this technical quality is illusory. They simply picked up enough of the buzz words and ideas so that their proposal gets a good technical score. You end up with a situation where it is very difficult for the contracting officer to discriminate on technical competence among the different bidders. He is in the position of having several bidders who do not seem very different qualitatively because they are all proposing roughly the same thing, and the contracting officer awards to the low bidder.

In many cases, the Government ends up not getting what it wanted because the low bidder is simply not able to provide the kind of service that is required. It is a process that goes on frequently and is closely tied to the BAFO problem, which I know this committee has addressed in the past.

COMPETITION IN CONTRACTING ACT (CICA)

Senator **Bingaman**. Your recommended solution on this, as I understand your testimony, is that we amend CICA, the Competition in Contracting Act, to provide specifically that awards can be made to other than the lowest bidder——

Mr. **Odeen**. Correct.

Senator **Bingaman** [continuing]. Without negotiation?

Mr. **Odeen**. Yes, Mr. Chairman, but there are several things we would propose to get at this problem.

Limiting the number of BAFOs—which I know this subcommittee has been supportive of—would be a big help. If there is only one set of discussions or one Best and Final, you are much less apt to have the problem of technical leveling. I might add you are also much less apt to have the kind of illegalities that have cropped up in the past. We certainly support limiting the Government to a single Best and Final.

We also believe the contracting officer should be empowered to make a decision without discussions where there is clearly a major distinction between the offerors in terms of technical content. This should be permitted if it is clear that one bidder is technically much better qualified, has much better proposal or a more innovative solution, and also has a reasonable price. Obviously, price is always a consideration, you cannot totally disregard it. However, if the price is reasonable and the technical content is clearly higher, the contracting officer should have the option, at least, to award at that point rather than stretching out the process and going back for repeated discussions on BAFO's.

We think this will have benefits in terms of reduced costs and timeliness.

One other factor is the need to make it clear in the request for proposal (RFP) what the technical requirements are so it is clear as to the level of experience and the level of training and education that are required. This would make it easier for the contracting officer to differentiate the quality of the proposals.

Senator BINGAMAN. A main thrust of your testimony, Mr. Odeen, is one that I have heard now for several years. It may be accurate. I do not doubt that it is. That is, that you believe is very strongly that in the actual awarding of contracts the quality of the services being provided is given way too little emphasis in the case of technical and professional services. And the cost is paramount, that is the one thing that the contracting officer uniformly comes back to and says we are going to award on the basis of the lowest cost.

We tried to fix that a couple or 3 years ago with an amendment to CICA, indicating that the quality needed to be factored in as a very important item. Obviously your view today is that it did not work and you want us to go back and amend CICA again to say we really meant what we did 2 or 3 years ago.

Is this really something we can do with just amendment after amendment to CICA every couple of years? I mean, is this something that we can legislate a solution to or is this something that needs to be addressed some other way?

Mr. ODEEN. Well, I believe legislation would be helpful in terms of a further clarification about the importance of quality. But, most of the solution has to involve regulatory/administrative change. I do not think simple changes in CICA alone will solve the problem. It would be helpful, we believe, but it is not the ultimate answer.

The more important issues are the things I suggested, such as efforts on the part of the contracting community to make more specific and clear-cut the quality required to meet the Government's needs by laying that out more clearly in their RFPs, making sure that they follow-up, considering past performance, and making sure that a firm that is being considered for an award, and in fact, has performed quality work at a reasonable cost in the past and not simply reading the words in the proposal.

We think efforts to improve cost realism would be helpful to get around the gaming that tends to go on.

There are a whole series of things—mostly regulatory in nature—that need to be done to solve this problem. It is not easy for the contracting officer to do this. He has to make some tough judgments, he has to take some and make tough choices.

The easy way is always to go to the low bidder. You never get in trouble for awarding it to the person who came in with the lowest price. Whether the Government ends up getting what it wants does not really matter. But, the contracting officer is safe, he is secure.

So, we need to attach this tendency to go to the low bidder because that is the easy way out and it is a low-risk answer. This requires us to resolve the training and professionalism issues, Mr. Chairman.

Senator BINGAMAN. Okay. Thank you.

Let me defer to Senator Wallop for questions that he has.

Senator WALLOP. Mr. Chairman, thank you, and let me apologize for being late. I would also like to have my statement submitted for the record.

[The prepared statement of Senator Wallop follows:]

PREPARED STATEMENT OF SENATOR MALCOLM WALLOP

Mr. Chairman, once again let me join you in welcoming our witnesses. Over the last several weeks we have heard from government officials and academic organizations on the acquisition, technology base, and industrial base issues confronting us during this session of the 101st Congress. I am pleased that we will hear today from the individuals and associations who work with the Department of Defense to provide goods and services to our people in uniform.

Given the flood of new restrictions and requirements that have issued from the Congress and the Department of Defense, contracting with the government has become a complex and daunting matter. Not only have record keeping and audit requirements increased, but corporate cash flows have also been significantly affected and whole new categories of criminal conduct have been instituted. It is small wonder that the Center for Strategic and International Studies was able to document before this subcommittee such a rapid shrinkage in the number of defense contractors over the last several years.

The testimony we receive today will serve two important purposes. First, we can better take stock of the impact of recent statutory and regulatory changes on the ability of contractors to efficiently execute their contracts. Second, we can benefit from the insights of managers of successful corporation can provide on improving the efficiency of DOD R&D and production. As we face the challenge of providing for national defense in an environment of austere defense budgets, such counsel will be most timely and helpful.

VOLUNTARY DISCLOSURES OF WRONGDOINGS

Senator WALLOP. In regards to the recent agreement between the DOD Inspector General and the Justice Department, Mr. Menaker, on a formula for programs for voluntary disclosure of wrongdoing by contractors—could you give us a reaction, a view of this development, and did it make the DII program more attractive to potential member companies?

Mr. MENAKER. Yes, sir, I think I can. What that started with was a concern, I guess expressed about a year or so ago, by DOD as well as participants in the industry, that it was difficult to determine when in fact a company had made a voluntary disclosure. What was the point in time that the company became a participant in the program, that got the company into the program that was originally started by Deputy Secretary Taft back in 1986?

It was felt that some bright-line test would be helpful to do that. Where you could say at this point in time you crossed over the line and are in the program.

All along we have had what we've called XYZ agreements that are entered into between the voluntary disclosure and the DOD. That agreement basically sets forth the procedures that will be undertaken by the company and the Government once they are in the program. But the agreements are varied and it has never been clear as to what one company had to commit to versus another.

So, the DOD got together with the Justice Department and they felt that they would come out with a final version of what is called the XYZ agreement. That agreement very carefully sets forth the procedure of making a disclosure, the contents of a disclosure, the contents of a written report that the company might make should it choose to do so, the information it would provide, as well as at the same time protecting work product privileges and attorney/client privileges that very often arise in the course of a company's internal investigation.

With that agreement I think that the industry is now able to determine very clearly what they are going to do if they choose to make disclosures. They can figure out very quickly what their obligations are and what commitments they make, and they can depend upon consistency in the disclosure process, which is lacking, I think, up to this point in time.

So, I believe that the structure of this agreement will promote voluntary disclosures and will very much enhance the work that we are even doing it the DII. Yes, sir.

Senator WALLOP. Should we consider making these things mandatory? If we should, are there policy issues to consider before?

Mr. MENAKER. Yes, sir, there are. I would suggest that you then bring into play constitutional issues and State action issues.

The Supreme Court wrote extensively on this subject in the *Skinner* case. While they came down on the side of permitting in that case drug testing, random drug testing of railroad engineers, there was a lot of strong language, even in the majority opinion, on the State action issue. I think you would bring that into play and would significantly inhibit the process of investigations and disclosures.

Senator WALLOP. In essence you are suggesting that it would not be a good idea to make it mandatory?

Mr. MENAKER. That is correct.

Senator WALLOP. I would accept that counsel and hope that we do as well.

Mr. MENAKER. Thank you.

DEFENSE ENTERPRISE PROGRAM

Senator WALLOP. Mr. Lewis, in your statement you recommend extending the Defense Enterprise Program concept to cover all major programs in DOD. Yet, it is my understanding, as brief a time as I have been on this committee, that there has been a significant lack of support, even outright opposition, to the Defense Enterprise Program concept in the service bureaucracies.

Let me ask you two things. One, now would you characterize the success of the 10 programs thus far and how does that implementation need to be improved in order for us to get to the recommendation that you made?

Mr. LEWIS. I am only familiar with a couple of the programs there and I think I referred to some of that in the testimony. Those programs appear to have benefitted from that program.

There are some limitations. When I say extended, there are some limitations. Obviously, this is not a program that one would want to use universally. Its major applicability is to the major defense programs. That is where it is worth the effort.

I think the concern on industry's part is that if we get some successes in the big programs, this will suddenly stretch out into all programs where it is not applicable.

So, I think being chosen on a program-by-program basis is appropriate. The evidence that we see so far I think is positive. That was the reason for my statements.

Senator WALLOP. But what is the resistance within the service bureaucracy?

Mr. LEWIS. Well, again, I believe that it is providing a formality, another set of formalities and other rules and regulations. There is a concern that this will limit the flexibility that they have in managing programs. At least, that is my understanding.

Senator WALLOP. In a strange kind of way I could understand that. I mean, it is yet another way of doing the same kind of thing. But its purpose was the opposite, was it not? Its purpose was to provide a little more flexibility, not less.

Mr. LEWIS. Yes. Of course, there are some risks with the point where the program manager, the PEO, has the ability to basically waive most of the rules and regulations. Again, as you can well imagine, in a—I use the term guardedly—in a bureaucracy there is some reluctance to have somebody with the kind of authority to waive those when there are such legal and other considerations that go into waiving some of these. I mean, they may be waiving something that is illegal at the time. So, I think they are concerned potentially about a program PEO with that kind of authority that can go through and basically waive things that perhaps are not in the best interests of the programs.

But I think on the large programs, that has proven effective, that certainly is the way it is done within industry. If you look at our program managers within industry, our program managers are assigned as an extension of the general manager of a division and he lives within the guidelines, the legal and corporate guidelines. But, outside of that, he has the ultimate authority within the company to go across functional lines to get what needs to be done.

We think that is the basis that you are attempting to work this on, and we think that is a sound basis.

Senator WALLOP. The key is trying to give confidence to managers that their decisions will not be second-guessed.

Mr. LEWIS. I believe that is one of the items that needs to be encouraged. Yes, sir.

Senator WALLOP. It is not hard to see in today's climate why contracting officers and others would be quite low to go very far waiving anything.

Mr. LEWIS. Yes, absolutely. Yes, sir.

Senator WALLOP. You can get in quite a bit of trouble for not doing enough, but you can get in worse trouble for doing too much.

Mr. LEWIS. Unfortunately that is not just contracting officers. I will have to say that that also is now—because of the proliferation of certifications, et cetera, those same concerns are also affecting the defense contracting industry in that we find within our own businesses people that are less willing to act in what we consider to be an aggressive do what is right, but instead they want to go talk to the lawyer first as to whether this is the right thing to do or not.

Senator **Wallop**. You have to certify your innocence before you can take action.

Mr. **Lewis**. Yes, sir. You are at an excellent issue.

Senator **Wallop**. Well, you know, we have seen it in so many areas of the hearings that this committee has held. Fear of scandal makes us uncertain. We avoid potential scandal by simply not doing anything. That would be a scandal in its own right.

Mr. **Lewis**. Yes, sir. I would like to again—and I know this committee is well aware of this—remind the committee, though, that there are some 3 million people involved in the defense and aerospace business. Probably more than that when you count all the peripheral. If you count the number of people that we have had that are really found guilty, I am amazed. If you took a company that had 3 million people in it, my guess is you would find a lot more problems than what we found in the defense industry.

FIXED-PRICE R&D CONTRACTS

Senator **Wallop**. You also advocate modifying the law to prohibit the use of fixed price R&D contracts for the development of systems over $10 million. That seems to place us in an unfortunate position when Congress has to legislate specific types of contracts into law.

Do you believe that there are no occasions when it makes good business sense to use a fixed price contract for large scale development programs?

Mr. **Lewis**. When you say large scale development, that is when you have gotten into the trigger word. Then I would say that I cannot think of where it is in either the Government's best interest or a contractor's best interest where the fixed price contracting instrument is the right way on a large fixed price development.

If you were to have stopped that and said that certainly some development contracts can be handled fixed price, they can. Unfortunately, as my testimony shows, at least to my knowledge, the exclusion that was put into the law that permits—or, an exception that permits an exception to be made—to the best of my knowledge is that every exception has been granted. When somebody came forward and wanted to have a fixed-price development that went over the $10 million, those were granted.

Now, I believe, that says that there is something that is not working right in the system. That is a very critical point for industry and the health of the industry because, as you know, we are basically operating in a monopsony, and given that set of circumstances there are companies that must respond to whatever the business opportunity is.

So, you find bad things or dumb things, or dumb business things are happening where corporations will bid on those fixed price development programs and 2 years later they are in serious trouble. Maybe they get new management at this time. But in the meantime the industry and the Government are not getting the product they wanted.

Senator **Wallop**. I guess I am just reluctant to put into law a fixed level beyond which judgment is suspended.

Mr. **Lewis**. Well, of course, we are advocating that it should not be used under any circumstances. Now, obviously, there has got to be an exception put in there, but you would hope that every exception then would not get granted.

BID PROTEST SYNDROME

Senator **Wallop**. Mr. Odeen, on page 9 of your testimony, under the heading Bid Protest Syndrome, you state, and I quote, "Since the industry does not trust the procurement system to be able to provide a fair and rational decision, the bid protest syndrome has become a proxy for the major flaws in the services procurement." Yet, throughout the rest of the statement you advocate the awarding of contracts on quality rather than price.

You see where I am heading. The further you move from objective quantifiable price award criterion toward quality factors, the more subjective the process becomes.

So, how do we push the Defense Department toward the use of quality without exacerbating the bid protest opportunities?

Mr. **Odeen**. That is a very good question, Senator. In many cases, the protests are submitted because an offeror is confident he had the best solution, he had the best people, and he best met the Government's needs. Yet, he loses the award because he was not the lowest price bidder.

It is very frustrating when that happens to you. You know you are doing what the Government wants. You know you are going to provide what they need, and the other person simply cannot do it.

One of the ways you respond is to protest. Protests are expensive and you seldom win. Firms do not protest very often. They only do so under really unusual, egregious kinds of circumstances. Yet, we have seen a big increase in the number of protests.

To a considerable extent, if we had a sense that we were getting a fair shake, that our proposals were evaluated fairly, that the full range of needs, technical needs as well as the price, were considered, we would be less apt to lodge a protest.

The other action we think is necessary to minimize protests is for the Government to be much more explicit in terms of the quality it needs to do the job. Is this a job that requires Ph.D. physicists? Does it require people that have years of experience? Does it require specific kinds of background and experience?

If the Government can be more explicit in its RFPs, then it is easier to respond to it in a way that the contracting officer can measure whether or not the offeror, in fact, is being responsive.

The Government simply does not do a good job of spelling out what it needs in terms of quality and performance. That kind of sloppiness makes it hard for the contracting officer to make a clear-cut decision on the quality factors so he tends to revert to the price differences.

So, if you want to reduce protests, it means giving us a sense that the process was fair. We may have lost, but at least we were given a fair shake. Second, the Government must be more explicit in the RFP to spell out what is really needed so that the contracting officer has an opportunity to make a sensible judgment as to which bidder is best qualified. We think the solution is a combination of those two.

Of course, the final concern we have is the lack of experience, training and qualifications of many of the contracting officers making these decisions. The better contracting officers gravitate to hardware procurement. We feel the training in how to buy professional services, which is very different than buying hardware, is simply inadequate.

Steps need to be taken to upgrade the quality of the Government buyer. If you have a quality contracting officer, you are more apt to get a sensible, sound decision and less apt to have a bid protest.

Senator WALLOP. So, you think that with more expertise and explicitness you would not take the bid protest hat off the head of the quality guy who is frustrated and put it on to the head of the low-price guy who thinks, "I am entitled to it because I am the low-price guy?"

Mr. ODEEN. Yes, sir.

Senator WALLOP. I guess what I am trying to say is are we going to change——

Mr. ODEEN. A different set of protests?

Senator WALLOP [continuing] The roles of the protestors?

Mr. ODEEN. I believe you would have fewer protests if it is clear in the REP that you require a certain level of quality, a certain technical content and a certain type of staff and/or experience. If that was required in the RFP—and it was stated that low price was not going to be the primary factor—then you are in a weak position to come in and argue, "Gee, I was the cheapest." This would not be a sound basis for protest because there would be a clear-cut set of performance and qualification. In that case, I think you would be less apt to have a protest.

A lot of people now protest out of frustration. At least, the few times my firm has protested, it has been because we just felt we had really been had and we protested out of pique and annoyance and frustration.

Senator WALLOP. I think you have answered my last question, but let me have you reaffirm it because in your testimony you point out several problems with DOD's acquisition of professional and technical services.

Under the Competition in Contracting Act, the strongest emphasis, you say, is that of price over best value and best quality. Again, is the low-bidder mentality a problem with the actual language of the law or DOD's implementation of it?

I think what I heard you say is that it is principally the implementation of it where it explicitly does not permit them to make a judgment over the low-priced bidder.

Mr. ODEEN. We believe some modification to CICA would be helpful—and I realize there were modifications a couple of years ago—but making it more explicit that quality in cases of high technical content requirements and quality needs outweigh costs is very important.

The ability to award to the higher quality bidder where it is clearly in the Government's interests to do so, even if that person is not the low bidder, would be a useful change to the law.

But, most of the solution is in the regulatory area and the training, the experience, the backgrounds of the people involved. You cannot fix this problem by legislation alone. It is not going to go away regardless of how many changes you make to CICA. We think legislation could be helpful, but it is primarily in the area of how the procurement process operates.

Senator **Wallop**. Some modification to give confidence on this.

Mr. **Odeen**. Yes, sir, and perhaps a signal. The contracting officer does not want to take a risk in the current environment. The contracting officer seldom takes a risk if he or she awards to the low bidder. However, if you make a tough choice and say this person is clearly better qualified, or he or she can do a much better job, or the Government is going to get more value, then there is a risk. People understandably do not take a lot of risks these days.

Senator **Wallop**. Congress is not loathe to add to that risk. [Laughter.]

Thank you, Mr. Chairman.

Senator **Bingaman**. Thank you.

We have another panel, so I think we will go ahead and stop our questioning of this panel now. Thank you all very much for your testimony. It has been very useful. We may have some additional questions we would submit to you in writing to get your thoughts on them.

Our second panel is composed of Mr. Christopher Galvin and Mr. R. Noel Longuemare. If they would come forward.

At the hearing that this subcommittee had on May 17, Professor Tom Murrin, who is the Chairman of the Defense Manufacturing Board, cited Motorola as an example of how a U.S. company could actually change its way of doing business in order to become a world-class quality producer.

Mr. Christopher Galvin, who is Motorola's Executive Vice President that led that effort, is now chairing the Defense Manufacturing Board's Task Force on Quality. We have asked Mr. Galvin to give us his recommendations on how the Department of Defense can improve in the area of quality management.

The 1989 Defense Act directed the Department of Defense to submit a plan for developing critical technologies. The Aerospace Institute of America has initiated a similar effort called Key Technologies for the 1990s. Mr. Noel Longuemare is Vice President and General Manager of the Westinghouse Electronics Group and is the Vice Chairman of the AIA's Key Technology Steering Group. He joins us today to tell us about this industry-sponsored activity and how industry and Government can work together in these kinds of efforts.

We welcome you both and we would go forward, I guess, with Mr. Galvin's testimony first.

STATEMENT OF CHRISTOPHER B. GALVIN, EXECUTIVE VICE PRESIDENT AND CHIEF CORPORATE STAFF OFFICER, MOTOROLA, INC.

Mr. **Galvin**. Thank you, Mr. Chairman. I very much appreciate the opportunity to address this subcommittee.

As you stated, my background, in this area is the result of my exposure to the Defense Manufacturing Board, my association with such a fine gentleman as Tom Murrin, interfacing with the total quality management activity within the Defense Department, and of course Motorola's experience in the changes we made in our institution that allowed us to win the Malcolm Baldrige National Quality Award here in 1980 on a corporate-wide basis.

My observation in studying this issue is that many extraordinary bright people, like those that are sitting here in this room, have been studying the problems within the Defense Department for years and have made substantive recommendations for change, thoughtful ones. Yet, today we sit in an environment where probably none of us are satisfied with the degree to which these changes have taken place positively.

We are students of change at Motorola. When one reflects in history, it is clear that when there was an external threat to the security of this country during World War II, the defense complex never worked more productively and efficiently.

But in seeking a peacetime alternative to how does one create an agent for change, I did suggest to the Defense Manufacturing Board that the Defense Department seek to become a world-class customer and lead the defense complex in this activity.

Now, when I have read and listened to the testimony of committees like this as they deal with Defense Department issues, most people come with a very thoughtful list of problems and solutions that relate to the already existing programs. If it is changing the manufacturing environment, people would address the IMIP program, the Industrial Incentives for Manufacturing Program, and say if we could just weak it a little bit, or add some money to it, we could have some dramatic change.

Well, I come today with a somewhat different proposal, somewhat broader. I believe that the Congress should, through overriding legislation—overriding above everything else—establish quality, reliability, and total cycle time management goals that are way beyond today's imagination.

Now, someone says, "Gee, that sounds a little ambitious to accomplish." But, think of what John Kennedy did for this country in the space program in 1961. He suggested we would land a man on the moon in 10 years. A goal that when you looked at the capacity of the country—the jet propulsion laboratory and the NASAs, we paled by that ambition. Look at what was built up—infrastructure, communications systems, technologies, the reliabilities systems, the institutions that allowed us to put a man on the moon 8 years later.

I contend that the methodology of setting a goal that is way beyond the capacity of the institution, leads to very significant change.

I listed in my testimony, which has been submitted from a written standpoint, the milestones that one can use to measure this. We happen to use a strict application of statistics and we have coined our program at Motorola Six Sigma, which designates the application of statistics. But, it has milestones that over a period between now and the year 2000 that the defense complex—first, the Defense Department and then all of its suppliers should seek to achieve virtual perfection—virtual perfection in absolutely every aspect of the activity, in administration, in setting specifications, in doing design out of the design commands, in deploying weapons systems, in manufacturing them, in handling logistics commands in maintenance and service commands, in running bases, and in running battalions.

We also set very aggressive roles in reliability—in the meantime, between failure activities. Also, I suggest that by the year 2000 that there will be no major weapons system that will take longer than 7 years from concept to production and delivery, and that this will be the longest period of time that a submarine or a tank will take place to build.

This concept of establishing a goal is similar to the concept of the Gramm-Rudman bill where we said that we would determine that there would be some reductions in the budget over some period of time. A stake was put in the ground.

What is a quality system? I think it is important to understand what that is. A quality system is the determining of every possible failure mode or error in a system, measuring it, and then seeking its total eradication.

I have suggested to the Defense Department that a quality system does not exist at this point in time in the Defense Department, not because people are not trying, or because there are lots of interesting activities going on, but it really has not been invented yet.

The people that have to invent the defense quality system are the commanders of artillery commands and logistics commands because they are the people who have to go through and determine what are the 15 or 25 catastrophic failures that allow a mission to fail. Then they begin determining what are the modes that caused that failure. Then they measure them and then they begin to eradicate them. Suddenly the system begins to significantly improve.

By the way, there are already in place significant DOD initiatives in this area. Total quality management, the Defense Manufacturing Board activity, and the streamlining process of the acquisitions are all very positive things.

The real issue is: Is there a dynamic? Is there a motivator to accomplish significant change? The design is where most of the manufacturing problems result. We have to begin with the Defense Department to make those improvements.

I propose that this be done in Congress as opposed to the executive branch. People have asked me why I propose such a thing. Mainly because we know that every 4 years the executive branch can change its leadership. The appointments tend to be of shorter duration in the Defense Department than in fact in the Congress where the average tenure in Congress is longer.

This process is going to take 10 years to achieve—at least 10 years. To achieve virtual perfection it is going to require going back phase after phase after phase in improving the process.

So, I leave you with this concept in summary. It is possible—and I suggest that it is because at Motorola the process is working—that the Congress can establish overriding goals that are bigger than the self-interest of the bureaucracy and bigger than the self-interest of parts of the Department to achieve virtual perfection in everything that goes on with defense activities. In this case, it will make a significant improvement to the industrial base. People will want to come back into the defense business.

We determined that in the 1960s we could catch up to the Russians and surpass them in the space program by setting very high goals that no one thought we could meet. I contend that if the defense complex, in this case, had goals like this and achieved them, that they would catch and surpass the Japanese, because these are the kinds of things the Japanese are pursuing, but they have yet to acheive them to this magnitude in this instance.

Therefore, if we engage the process of utilizing the science of eradicating errors in their entirety, we will put the Defense Department in purposeful motion to fixing these problems and give it the motivation and the catalyst and the dynamics to make the changes that have been suggested in these testimonies to occur.

Thank you.

[The prepared statement of Mr. Galvin follows:]

TESTIMONY BY CHRISTOPHER B. GALVIN, MOTOROLA, INC., BEFORE THE U.S. SENATE SUBCOMMITTEE ON DEFENSE INDUSTRY AND TECHNOLOGY

ABSTRACT: NEW APPROACH: DEMAND THE ACHIEVEMENT OF NEAR PERFECTION IN ALL DEPARTMENT OF DEFENSE ACTIVITIES BY YEAR 2000

Congress can continue to pursue fixing U.S. Defense structural and operational problems program-by-program. A better approach would be to set overriding and very ambitious goals for quality, reliability and cycle time management improvement by the year 2000. This would force Department of Defense and its suppliers to fix 50% to 60% of the known defense industry problems from within.

The suggestions contained herein address improvement of the operations and performance of the U.S. Defense Department and industry.

A CHALLENGE FOR THE U.S. DEFENSE COMPLEX: ACHIEVE VIRTUAL PERFECTION BY THE YEAR 2000

Although it is still the best in the world, the U.S. Defense Complex requires significant change. In reports from the Packard Commission and Defense Science Board, some of the brightest individuals in our country have identified overly bureaucratic, complicated, slow and sometimes wasteful mechanisms to organize, staff, supply, and support United States strategic and military defense services. Needed change has not occurred in significant enough proportions.

What can cause change?

Crisis causes change. For example, the U.S. Defense Complex was never more efficient and productive than during World War II.

A peacetime concept for seeking an agent of change is being proposed by the Defense Manufacturing Board. It suggests that the U.S. Defense Department transform itself into a world class customer, thereby creating changes in systems and expectation levels that might lead the U.S. Defense industry to a dramatically higher level of performance.

In addressing industrial base deterioration, lengthy procurement cycles, potential surge capacity shortcomings, lagging manufacturing investment by defense suppliers, etc., most recommendations are designed to augment existing programs. In research and development, for example, expert reports reference the I R & D program suggesting specific changes in that one aspect. Or for factory modernization, others would call out the IMIP program and suggest additional investment or some specific modifications. Only a few of these superb reports have called for a broader or universal concept of change. Most are attempting to use the existing system to resolve the issues.

There is another alternative. It is one that requires some knowledge of management of quality techniques and a bit of courage, but no additional expenditures of the Federal Budget. The Congress could set 10-year U.S. Defense Department and Defense Industry goals for quality, reliability, and cycle time management improvement that are more ambitious than anyone has yet to imagine.

This idea is based on the premise that high goals force people to stretch beyond their existing capability and drive fundamental and structural changes in institutions. To illustrate, reflect on the role President John F. Kennedy played in motivating the United States' initiatives in space. He declared an American would land on the moon in 10 years. This came at a time when the capability of the Jet Propulsion Lab and the concept of a NASA were elementary at best when measured by such an ambition. Many knowledgeable people suggested Kennedy's goal to be unachievable at the time. History marks the results.

The objective of Congress would be to improve significantly the cost, delivery time, quality, administration and reliability of every command in the Armed Services. The same standard should be set for all operations in the Defense Department, as well as all of its suppliers. For example, every facet of Department of Defense operations would have to perform at the following levels in the proposed time frames:

YEAR	1992	1994	1996	1998	2000
Quality **					
- In statistical (see attachment)	3.0 σ	3.5 σ	4.0 σ	5.0 σ	6.0 σ
or - In defects per 1 million opportunities for error	66,810	22,751	6,210	233	3
Reliability					
- Improvement from 1990 levels	+30%	+30%	+30%	+30%	+30%

YEAR	1992	1994	1996	1998	2000
Cycle Time Milestones					
- Major weapons	-	-	10 years	-	7 years
- Medium	-	-	6 years	-	4 years
- Small weapons radios, etc.	-	-	4 years	-	2 years

**σ refers to standard deviation (Sigma).
Per million levels assume a $\pm 1.5\sigma$ mean shift in process variability.

What does this mean? It means that Congress will insist that every failure made in every operational and administrative aspect of the Armed Services will be measured using the mathematical concept called statistics. Acceptable defect rates of 1 out of 20 (or 95% success) today will change by Congressional challenge to only 3 defects per 1 million by the year 2000. As for reliability of weapons and systems, the mean time to failure will no longer be measured in hours but in years and decades. It's possible. In radio paging product ("beepers"), Motorola measures mean-time-to-failure in centuries. Finally, some major weapons development programs have taken more than 20 years to deploy, according to a recent Navy study. Using Congressionally motivated cycle time management techniques, the Defense Complex could design, refine, manufacture and deploy major new systems in less than seven years by the year 2000. With specific milestones established, they become Department of Defense's targets for continuous improvement.

Defense Department contracting officers should not misconstrue this Congressional Quality initiative as "just another specification" to impose on their suppliers, although layering on these improvement targets will be the first and natural reaction. The dynamic of this process will take place when the contract administrators, the Defense audit agencies, the Armed Services systems and logistics commands and others discover that the Defense supplier can't achieve quality unless Department of Defense's interface with the supplier improves significantly.

Quality begins with good designs. It is now well known that 70% of manufacturing cost overruns result from poor design and lack of sensitivity to the manufacturability of a design. The Department of Defense will change its mechanisms for setting specifications, applying cost and compliance rules, and determining selection criteria for vendors. The procurement policy and procedures will be revisited. In other words, Department of Defense will have to transform itself into a world-class customer. Ambitious and overriding quality, reliability and cycle time goals represent the outside change agents. Department of Defense needs a motivator to overcome the natural self-interest and resistance to change of all levels of the Department. One should not forget that, for the most part, Defense Contractors do exactly what their customer tells them to do .

A robust quality system doesn't exist within the Defense Department. It's not because some fine Federal employees aren't trying. It's because it hasn't been invented yet. Neither Deming, Juran nor Motorola can hand Department of Defense the formula for a quality management system. You see, the management of Quality begins with identifying every possible opportunity for error -- every opportunity. Then management sets priorities as to which failure modes jeopardize a mission, for example. Only a tank commander or a logistic head knows the most feared failure modes. Eventually, all opportunities are eradicated by measuring these key variables statistically and seeking continuous improvement. But prioritization is a key. This process applies to paperwork flow, administrative processes, follow-up systems and many other non-product aspects of the Pentagon's activity. Anything one can measure, one can improve.

Some fine Department of Defense programs now being implemented complement the concepts of reduced cycle time and improved quality. The most notable are Acquisition Streamlining, Total Quality Management or TQM, and joint Department of Defense/Industry efforts to implement improvements through the Defense Manufacturing and other 'Boards.' Acquisition Streamlining is based on the premise that in buying, Department of Defense should pare its system requirements to basic functional needs and eliminate the costly 'baggage' of layers of overly prescriptive, outdated 'how to' specifications. Moreover, Streamlining seeks inputs from industry as to how to best fulfill Department of Defense functional needs. These are important components of reduced cycle time.

Significant quality improvements take place over time and occur in phases. To improve quality early on, most people do their everyday tasks a little better each day. This is good. Department of Defense's Total Quality Management initiatives are stimulating this process. Regrettably, this instinctively positive process only produces 10% or 30% improvements when 100 times improvements might be necessary and possible. To achieve such significant levels of improvement, it has to be demanded.

New and very aggressive quality objectives create a market-like force for change. They point out that current management techniques may inhibit the ability to improve. So people begin modifying the system (bureaucracy) to meet the goal. They must remove the bureaucratic barriers (certain Federal acquisition regulations, excessive record-keeping and audits, Congressional budget approval process, etc.) themselves or they often cannot achieve the improvement. By setting dynamic overview operational goals, Congress will motivate the U.S. Defense Complex to learn and change significantly from within.

Congress would host a major responsibility in supporting and controlling these overriding quality, reliability and cycle time improvement initiatives. Such a process will stimulate 10 or maybe a few hundred, specific proposals for regulatory, audit, process, and budget procedure modifications over the next 10 years. All of them will be designed to reduce the opportunity for errors, enhance reliability and streamline the bureaucracy to meet Congress' goals. Therefore, Congress itself may have to commit to reform legislation on a fast-track basis and promise that any such legislative or regulatory change will be decided upon in no longer than 90 days. In this way, Congress must set a cycle time management goal for itself. This 90-day goal may encourage Congress to re-examine a system that now accommodates numerous committees and subcommittees with some jurisdiction over Defense matters.

To control and monitor Department of Defense's progress in meeting its biannual milestones, Congress must exercise its leadership and prerogative in at least three areas: first, the Federal Budget process to endorse Department of Defense's quality initiative; second, the Congressional appointment approval process to discipline staff appointments to those who can or are delivering Department of Defense quality and cycle time results; and third, the Congressional hearings process and year-end reports to monitor progress.

Some people have estimated the cost of quality (not doing things right the first time) to be 8-20% of total expenditures. At Motorola 8-10% is the cost of quality estimate. If a 20% cost of quality were applied to a Defense annual budget of $300 billion, this would represent $60 billion in potential savings in Federal expenditures. Perhaps more important for national security could be the knowledge that there is only a 3 part-per-million chance that a missile or projectile will misfire or that a weapons system would be delivered five years late.

Congress could change its role somewhat from its constructive operations management role (fixing Department of Defense's cost, quality, manufacturing capability, and managing by line item, etc.) to that of a kind of board of directors for Department of Defense. The role of a Board is to set broader objectives that drive operations to reach out and achieve greater overall performance. Rarely does a board of directors set out the specific day-to-day operational plans of any institution. Congress should address other pressing Defense issues such as choice of major weapons systems, treaty enforcement and approval, and overall budget expenditures.

Quality, reliability, and total cycle time enhancements are fundamental to maintaining a viable U. S. military industrial base. Many of those industries lost to the U.S. industrial-military complex exit because they can't afford to do business with Department of Defense, given its overly prescriptive and bureaucratic approach to conducting business. It's also true that some of these companies can't perform at world class levels of quality, reliability and cycle time. If the Department of Defense and Congress became partners in stimulating these quality enhancements throughout the defense industry, U.S. defense suppliers may catch up and surpass the Japanese by the year 2000. It's possible. After Sputnik, the U.S. caught and surpassed the Russians in space during the 1960's. In addition, other commercial institutions may re-enter U.S. military supply markets in order to participate in the management improvement processes initiated by Congress. This will drive their companies to become world class. Such transformation could be made possible by requiring the Department of Defense to engage the science of managing and eradicating all known and potential defects or errors. It's the over-reaching stimulus that would help Department of Defense become a world class customer. Seeking virtual perfection by the year 2000 will put the Department of Defense in purposeful motion.

MOTOROLA

TESTIMONY BY CHRISTOPHER B. GALVIN, MOTOROLA, INC.,
BEFORE THE U.S. SENATE SUBCOMMITTEE ON
DEFENSE INDUSTRY AND TECHNOLOGY

SIX SIGMA
6σ

OUR SIX SIGMA CHALLENGE

WHAT IS SIX SIGMA?

Six Sigma is our FIVE YEAR GOAL to approach the Standard of Zero Defects, and be best-in-class in EVERYTHING we do.

WHY SIX SIGMA?

The performance of a product is determined by how much margin exists between the design requirements of its characteristics (and those of its parts/steps), and the actual value of those characteristics. These characteristics are produced by processes in the factory, and at the suppliers.

Each process attempts to reproduce its characteristics identically from unit to unit, but within each process some variation occurs. For some processes, such as those which use real-time feedback to control the outcome, the variation is quite small, and for others it may be quite large.

Variation of the process is measured in Standard Deviations (Sigma) from the Mean. The normal variation, defined as process width, is ±3 Sigma about the mean.

Approximately 2,700 parts per million parts/steps will fall outside the normal variation of ±3 Sigma (see chart #2). This, by itself, does not appear disconcerting. However, when we build a product containing 1,200 parts/steps, we can expect 3.24 defects per unit (1200 x .0027), on an average. This would result in a rolled yield of less than 4%, which means fewer than 4 units out of every hundred would go through the entire manufacturing process without a defect (see chart #3).

Thus, we can see that for a product to be built virtually defect-free, it must be designed to accept characteristics which are significantly more than ±3 Sigma away from the Mean.

It can be shown that a design which can accept twice the normal variation of the process, or ±6 Sigma, can be expected to have no more than 3.4 parts per million defective for each characteristic, even if the process mean were to shift by as much as ±1.5 Sigma (see chart #2). In the same case of a product containing 1,200 parts/steps, we would now expect only 0.0041 defects per unit (1200 x 0.0000034). This would mean that 996 units out of 1,000 would go through the entire manufacturing process without a defect. To quantify this, Capability Index (Cp) is used; where:

$$Cp = \frac{\text{design specification width}}{\text{process width}}$$

A design specification width of ±6 Sigma and a process width of ±3 Sigma yields a Cp of 12/6 = 2. However, as shown in chart #4, the process mean can shift. When the process mean is shifted with respect to the design mean, the Capability Index is adjusted with a factor k, and becomes Cpk. Cpk = Cp (1 - k), where:

$$k = \frac{\text{process shift}}{\text{design specification width/2}}$$

The k factor for ±6 Sigma design with a 1.5 Sigma process shift $= \frac{1.5}{12/2} = 0.25$ and the

$$Cpk = 2\,(1 - 0.25) = 1.5$$

It is, therefore, our FIVE YEAR GOAL to achieve ±6 Sigma capability in EVERYTHING WE DO!

Issue 1

Chart #1

OVERALL YIELD vs. SIGMA

(Distribution Shifted +/- 1.5σ)

Number of Parts (Steps)	±3σ	±4σ	±5σ	±6σ
1	93.32%	99.379%	99.9767%	99.99966%
7	61.63	95.733	99.839	99.9976
10	50.08	93.96	99.768	99.9966
20	25.08	88.29	99.536	99.9932
40	6.29	77.94	99.074	99.9864
60	1.58	68.81	98.614	99.9796
80	0.40	60.75	98.156	99.9728
100	0.10	53.64	97.70	99.966
150	----	39.38	96.61	99.949
200	----	28.77	95.45	99.932
300	----	15.43	93.26	99.898
400	----	8.28	91.11	99.864
500	----	4.44	89.02	99.830
600	----	2.38	86.97	99.796
700	----	1.28	84.97	99.762
800	----	0.69	83.02	99.729
900	----	0.37	81.11	99.695
1000	----	0.20	79.24	99.661
1200	----	0.06	75.88	99.593
3000	----	----	50.15	98.985
17000	----	----	1.91	94.384
38000	----	----	0.01	87.880
70000	----		----	78.820
150000	----		----	60.000

USE FOR BENCHMARKING

Chart #2

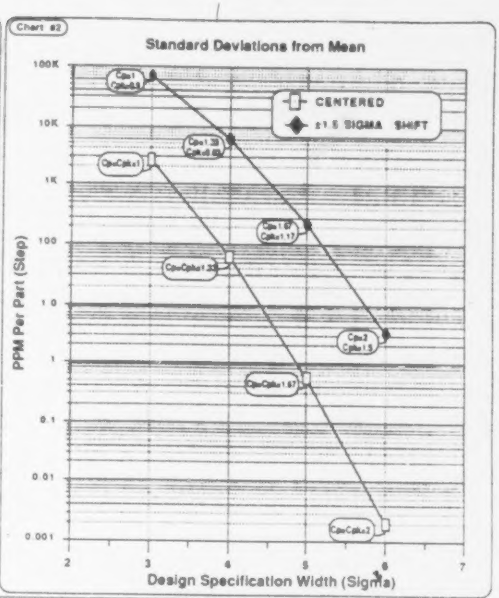
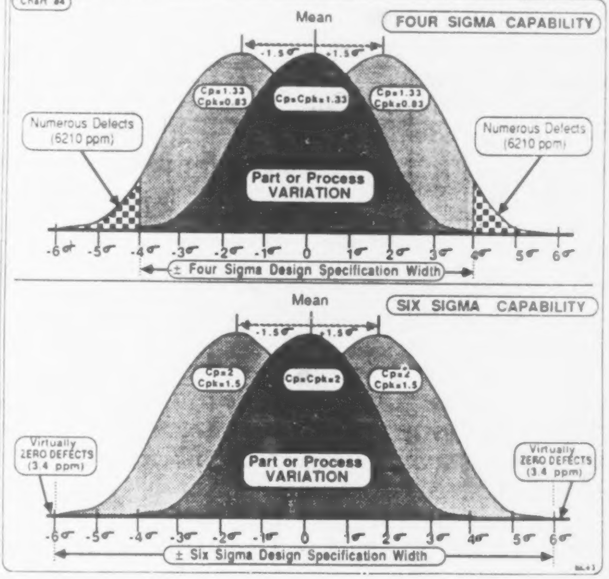


Chart #3

TOTAL DEFECTS PER UNIT	ROLLED THROUGHPUT YIELD (%)
5.3	0.5
4.6	1.0
3.9	2.0
3.5	3.0
3.2	4.0
3.0	5.0
2.3	10
1.9	15
1.6	20
1.4	25
1.2	30
1.0	37
0.9	40
0.8	45
0.7	50
0.6	55
0.51	60
0.43	65
0.36	70
0.29	75
0.22	80
0.16	85
0.10	90
0.05	95
0.00	100

Rolled Throughput Yield (%) = 100 $e^{-d/u}$

Chart #4


Mean
FOUR SIGMA CAPABILITY
-1.5σ
+1.5σ
Cp=1.33 Cpk=0.83
Cp=Cpk=1.33
Cp=1.33 Cpk=0.83
Numerous Defects (6210 ppm)
Numerous Defects (6210 ppm)
Part or Process VARIATION
-6σ -5σ -4σ -3σ -2σ -1σ 0 1σ 2σ 3σ 4σ 5σ 6σ
± Four Sigma Design Specification Width
Mean
SIX SIGMA CAPABILITY
-1.5σ
+1.5σ
Cp=2 Cpk=1.5
Cp=Cpk=2
Cp=2 Cpk=1.5
Virtually ZERO DEFECTS (3.4 ppm)
Virtually ZERO DEFECTS (3.4 ppm)
Part or Process VARIATION
-6σ -5σ -4σ -3σ -2σ -1σ 0 1σ 2σ 3σ 4σ 5σ 6σ
± Six Sigma Design Specification Width

Senator **BINGAMAN**. Thank you for that interesting recommendation. We will have some questions about it here as soon as we hear from Mr. Longuemare, who is with the Aerospace Industries Association of America and testifying on behalf of that association.

Thank you for being here, Mr. Longuemare.

STATEMENT OF R. NOEL LONGUEMARE, VICE PRESIDENT AND GENERAL MANAGER OF THE WESTINGHOUSE ELECTRONICS GROUP

Mr. **LONGUEMARE**. Thank you, Mr. Chairman, and members of the subcommittee. As you had noted, I do work for Westinghouse and I run what we call the Systems Development and Technology Divisions up in Baltimore. As such, we are involved in not only the development but also the application of technology in a wide variety of both military and non-DOD types of systems.

Today I am representing the Aerospace Industries Association and, as you note, the AIA is composed of some 50 of the major manufacturers of aircraft, avionics systems, and also aerospace products.

What I would like to do is just quickly get to the point of the message here. That is, we really believe that there is a severe foreign challenge that has to be met. Our position, therefore, has to be very clear. We really must improve our ability to compete in the world marketplace.

What my recommendation is this morning is that we need to focus on the development of technology. We do have the technological tools that are needed. We have the facilities, the managerial expertise. But what we really need is a new approach. We also need to add emphasis to this, and we need to speed up this whole process.

Incidentally, our whole approach here I believe is very much in consonance and complementary to what Mr. Galvin just said in the whole quality area.

The Aerospace Industries Association has sponsored the development of a new approach. We call this the Key Technologies for the 1990s. What we seek to do is to make this whole process of technology development much more affordable by taking advantage of the efficiencies that are inherent if we can get a national cooperative program going.

What this program we are talking about involves is an effort to add emphasis to a number of Key Technologies. We are selecting these, or we recommend that they be selected, on the basis of the highest leverage and the greatest payoff, or the broadest applicability to both the civilian and military sets of products.

We believe that this approach can affect the 2-to-1 increase in the productivity of the available resources we have, and we can also cut in half the time that is required to bring these to practice.

I would like to emphasize that this recommendation, the Key Technologies for the 1990s, is not just a proposal. We have been working at this for over 3 years now in AIA and I would like to include for the record a brochure and some other information that will give you some details on not only the approach, but also some of the technologies that we are looking at.

[The material was received and has been retained in the committee file.]

Mr. Longuemare. Now, in the coming months one of the key things that we are doing in this Key Technologies thrust is reconstituting what we call the Aerospace Technology Policy Forum. This is a group that was formed of key policymaking individuals from government, industry, and academia. These are the people who are going to provide the overall guidance to this program.

Now, last year we were able to enlist a significant number of the top officials in the Reagan administration, and what we are about to do now is to reconstitute this by getting on board some of their successors.

Earlier this year the AIA did take a significant step in this direction to make this a reality by forming an industry-sponsored National Center for Advanced Technologies, which we call NCAT. NCAT has really two major responsibilities. It is going to handle the day to day activities of this program and also is going to serve as a data respository for the decisions that come out of this whole process.

The concept we are talking about really is easily understood, but to make this a reality we need to have a policy environment that will allow it to happen easily and without a lot of barriers. To that end, as you know, R&D programs do require a substantial amount of investment on the part of industry.

We believe Government-sponsored incentives would be the significant thing needed to encourage investment and to confirm that there is Federal acceptance of this whole process. We believe that an incentive process is key to this success.

The stable funding of Government programs is also another requirement. The AIA is very much behind the concept of biannual funding and expanded multi-year procurement.

Simplification of the acquisition system is also very much needed, as has been noted before. Of course, over the last 2 years DOD has taken a lot of good steps in this direction, but there is a good bit more that needs to be done. The AIA has looked at this, and we have estimated that by having a substantially simplified process, the time it takes to bring these weapons systems to fruition could be reduced by as much as 50 percent, which is a great saving to the Nation.

Of particular importance to government contractors is the independent research and development, or IR&D, as it it known. We all believe that IR&D is really the very best existing process for developing new technology. It is really the lifeblood of a company. What we would like to recommend is, as the commercial sector does already, that the Government needs to recognize that this is just a normal cost of doing business and, as such, the Government should be able to share the full R&D costs, without limitations or ceilings.

Now, you ask, how do you control this? Well, there is a very well known and proven technique, and that is the competitive pressure that is involved that will cause this to seek its natural limit, as it does in all of the other competitive processes.

We also believe there is a need, as part of this program is concerned, to provide an adequate set of validation demonstrations. The Government should provide a framework within which this can operate such that the most critical demonstrations can be performed, and these should be done well before the fielding of new development programs, before the development programs are actually started.

Now, last but certainly not least, of course, is the need to build a better science educational infrastructure. This should be done through incentives for teaching at all educational levels.

Just to summarize this then, those of us that have been involved in this whole process from the aerospace industry, from the Government, and from the universities—who have helped initiate this whole process—we really believe that there are some substantial and significant improvements that can result. If we are successful, some truly fantastic developments can occur in the future and I think this is something that will greatly enhance the competitive position of the United States in the world marketplace.

Now, to summarize what we need to do, there are four basic ingredients we think are necessary.

The first one is having significant goals. For example, doubling the productivity of the available work force and resources and cutting in half the time for ideas to come to fruition.

Second, having industry play a leading role in a cooperative partnership both with government and academia.

Third, focusing on these technologies, the one that provide the highest economic leverage.

Then, finally four, we need to create a positive policy environment that will encourage the success of this whole development process for the United States.

Well, Mr. Chairman, I want to thank you for the opportunity to come here and present this, and I want to say that we really do want to work with your committee with the Congress and also with this administration. We believe that if there is a team effort and a team approach to this whole thing and we can get a cooperative program going, that there will be major benefits not only to industry but also to the Nation.

Thank you.

[The prepared statement of Mr. Longuemare follows:]

TESTIMONY OF R. NOEL LONGUEMARE
ON BEHALF OF
AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE:

MY NAME IS R. NOEL LONGUEMARE. I AM THE VICE PRESIDENT AND GENERAL MANAGER, SYSTEMS DEVELOPMENT & TECHNOLOGY DIVISIONS, WESTINGHOUSE ELECTRIC CORPORATION. TODAY I AM REPRESENTING THE AEROSPACE INDUSTRIES ASSOCIATION (AIA). AIA REPRESENTS 50 OF THE NATION'S MAJOR MANUFACTURERS OF COMMERCIAL, MILITARY AND BUSINESS AIRCRAFT, HELICOPTERS, AIRCRAFT ENGINES, MISSILES, SPACECRAFTS, AND RELATED COMPONENTS AND EQUIPMENT.

WE IN THE AEROSPACE INDUSTRY ARE GREATLY CONCERNED ABOUT AMERICAN INDUSTRIAL COMPETITIVENESS IN GENERAL AND THE FUTURE COMPETITIVENESS OF OUR OWN INDUSTRY IN PARTICULAR. THE AEROSPACE INDUSTRY REPRESENTS PERHAPS THE LAST BASTION OF AMERICAN TRADE SUPERIORITY. HOWEVER, WE ARE GRADUALLY LOSING GROUND. THE SEVERITY OF THE FOREIGN COMPETITIVE CHALLENGE MAKES OUR POSITION CLEAR: UNLESS STRONG ACTION IS TAKEN, WE WILL CONTINUE TO LOSE GROUND AND THIS COULD HAVE A SERIOUS IMPACT ON BOTH NATIONAL SECURITY AND INTERNATIONAL COMPETITIVENESS.

HOW DID THIS SITUATION COME ABOUT?

THERE HAVE BEEN A GREAT MANY CONTRIBUTING FACTORS, BUT IN MY OPINION THE DOMINANT ONE RELATES TO THE NATIONAL ATTITUDE TOWARD TECHNOLOGY DEVELOPMENT. IN THE WAKE OF WORLD WAR II, THE REBUILDING NATIONS OF EUROPE AND JAPAN LEARNED A LESSON FROM AMERICA -- THAT THERE IS A DIRECT CORRELATION BETWEEN A NATION'S TECHNOLOGICAL PROWESS AND ITS ECONOMIC PROSPERITY. EACH OF THE MAJOR INDUSTRIALIZED NATIONS MOUNTED AN INTENSIVE PROGRAM OF R&D TO UPGRADE ITS TECHNICAL COMPETENCE. THEY HAVE CONTINUED THESE

PROGRAMS UNRELENTINGLY EVER SINCE, AND THEY HAVE SCORED IMPRESSIVE SUCCESSES.

THIS IS NOT TO SAY THE U.S. ABANDONED ITS TECHNOLOGY DEVELOPMENT. THERE WAS, HOWEVER, A FAILURE TO RESPOND TO THE CHALLENGE AS VIGOROUSLY AS THE SITUATION WARRANTED. DURING THE LAST DECADE OR MORE, WE HAVE BEEN DRAWING HEAVILY ON THE U.S. TECHNOLOGY BASE, A BASE ESTABLISHED MAINLY DURING THE '50S AND '60S. UNFORTUNATELY OVER THE PAST TWENTY YEARS, WE HAVE NOT SIGNIFICANTLY UPGRADED OUR TECHNOLOGY DEVELOPMENT EFFORT. IN MANY AREAS, WE ARE STILL RELYING ON THE ADOPTION OF OUTMODED TECHNOLOGIES TO PRODUCE COMPETITIVE PRODUCTS.

MY RECOMMENDATION FOR A METHOD OF REVITALIZING THE U. S. COMPETITIVE POSITION IS TO FOCUS ON THE ENHANCEMENT OF U.S. TECHNOLOGY DEVELOPMENT. WE NEED TO HAVE THE BEST TECHNOLOGY POSSIBLE TO MAINTAIN OUR MILITARY SUPERIORITY AND TO COMPETE OR COOPERATE ON A GLOBAL SCALE. AEROSPACE ALREADY IS AN INTERNATIONAL INDUSTRY AND COOPERATION ACROSS NATIONAL BORDERS IS A WAY OF LIFE. IN THIS ERA OF INTERNATIONALISM, PARTNERSHIPS ARE FORMED BETWEEN THOSE WHO HAVE THE MOST TO OFFER. AT PRESENT, FOR EXAMPLE, BOTH JAPAN AND THE UNITED STATES STAND TO GAIN THROUGH COOPERATIVE VENTURES. HOWEVER, UNLESS SOME CHANGES ARE MADE BY 1992, WHEN THE EUROPEAN COMMUNITY FORESEES ITSELF AS HAVING A STRONGLY UNIFIED AND HIGHLY COMPETITIVE TECHNOLOGICAL CAPABILITY, JAPAN MAY SEEK BUSINESS PARTNERSHIPS IN EUROPE RATHER THAN IN THE U.S.

WHAT IS NEEDED IS A BOLD NATIONAL PROGRAM OF TECHNOLOGY DEVELOPMENT AIMED AT BRINGING TO THE INTERNATIONAL MARKETPLACE A LINE OF U.S. PRODUCTS OF SUCH UNDISPUTED EXCELLENCE THAT THEY WILL DOMINATE THE MARKETPLACE. I AM TALKING ABOUT PRODUCTS ACROSS A BROAD SPECTRUM, NOT EXCLUSIVELY AEROSPACE. WE MUST DEAL WITH HIGH TECHNOLOGY PRODUCTS WHOSE HIGHER VALUES MAKE THEM ESPECIALLY IMPORTANT IN THE WORLD TRADE EQUATION.

WE HAVE THE TECHNOLOGICAL TOOLS TO MAKE THIS POSSIBLE: THE FACILITIES, THE MANAGERIAL EXPERTISE AND A GOOD NATIONAL TECHNOLOGY BASE. WHAT WE NEED NOW IS A NEW APPROACH TO R&D. WE NEED TO ADD EMPHASIS, AND WE HAVE TO SPEED UP THE PROCESS.

LET ME CLARIFY THAT STATEMENT. THE TECHNOLOGY DEVELOPMENT CYCLE IS A LENGTHY AND RISKY PROCESS. FROM THE TIME A POTENTIALLY PROMISING TECHNOLOGY IS CREATED IN SOME LAB (TYPICALLY AT A UNIVERSITY), UNTIL THE TIME IT APPEARS ON A MILITARY OR COMMERCIAL PRODUCT, MANY YEARS CAN PASS. MOST OF THE TIME IS TAKEN UP IN IMPROVING PERFORMANCE, REDUCING RISK AND WORKING ON BOTH THE PRODUCT AND PROCESS TECHNOLOGIES TO MAKE THE RESULT BETTER THAN, OR COST COMPETITIVE WITH, CURRENT PRODUCTS.

TECHNOLOGY APPLICATION IS THE FINAL LINK IN A LONG CHAIN OF DEVELOPMENTAL ACTIVITIES. AS I MENTIONED, THE BASIC RESEARCH IS DONE IN A LAB SOMEWHERE. FROM THERE THE TECHNOLOGY MOVES INTO APPLIED RESEARCH WHERE ITS POTENTIAL IS MORE CLOSELY EXAMINED. NEXT, THE TECHNOLOGY MUST BE VALIDATED. IN THIS STEP, THE PROOF OF CONCEPT IS ESTABLISHED. FOLLOWING THAT, THE TECHNOLOGY MUST BE DEMONSTRATED TO PROVE ITS POTENTIAL IN SATISFYING SOME PRACTICAL NEED. IF ALL GOES WELL, THE TECHNOLOGY IS FINALLY READY FOR FURTHER APPLICATION DEVELOPMENT INTO A PRODUCT SUITABLE FOR THE MARKETPLACE. IN THE ELECTRONICS FIELD, FOR EXAMPLE, MUCH OF THE TIME INVOLVES DEVELOPING NEW MANUFACTURING PROCESSES TO MAKE POSSIBLE ECONOMICALLY FEASIBLE PRODUCTION OF THE NEW TECHNOLOGY.

FOR THOSE OF YOU WHO MAY NOT HAVE A FEELING FOR HOW LONG THIS WHOLE PROCEDURE TAKES, LET ME GIVE YOU A TYPICAL EXAMPLE. HISTORICALLY, IN THE APPLICATION OF NEW TECHNOLOGY TO COMMERCIAL AIRPLANES, SOME TEN TO TWELVE YEARS ELAPSE JUST BETWEEN THE TIME BASIC RESEARCH IS COMPLETE AND THE TIME THE TECHNOLOGY IS READY TO UNDERGO APPLICATION DEVELOPMENT. STILL MORE TIME PASSES BEFORE THE

TECHNOLOGY IS ACTUALLY READY TO TAKE ITS PLACE ON THE PRODUCTION LINE. COMPARED TO WHAT WE COULD BE ACCOMPLISHING, OUR CURRENT TECHNOLOGY DEVELOPMENT PROCESS IS A FRAGMENTED, OFTEN DUPLICATIVE AND LENGTHY APPROACH TO PRODUCT DEVELOPMENT. A SOBERING REALITY IS THAT THE TECHNOLOGY EVOLUTION CYCLE IN SOME FIELDS IS NOW SHORTER THAN THE TECHNOLOGY APPLICATION TIME, SUCH THAT WE ARE SOMETIMES FIELDING PRODUCTS WITH ALREADY OBSOLESCENT TECHNOLOGY. THIS GIVES FURTHER ADVANTAGE TO COUNTRIES WHO CAN SHORTEN THIS TECHNOLOGY APPLICATION PERIOD.

I HAVE TAKEN TIME TO MENTION THE DETAILS OF THE TECHNOLOGY DEVELOPMENT PROCESS BECAUSE I WANT TO EMPHASIZE THE POINT THAT THIS PROCESS REPRESENTS BOTH OUR TRADITIONAL AND CURRENT APPROACH TO THE REALIZATION OF ECONOMIC BENEFIT THROUGH NEW TECHNICAL DISCOVERIES. ALTHOUGH MANY OF OUR FOREIGN COMPETITORS GO THROUGH ESSENTIALLY THE SAME STEPS, SOME HAVE BEEN FAR MORE SUCCESSFUL THAN WE HAVE IN REDUCING THE OVERALL DEVELOPMENT TIME. THEY MADE THE EFFORT A NATIONAL GOAL, AND THE POSITIVE RESULTS ARE QUITE EVIDENT. TOYOTA, FOR EXAMPLE, GOES FROM PRELIMINARY NEW MODEL DESIGNS TO FINISHED CARS IN ONLY 36 MONTHS. OUR BEST EFFORT HERE IN THE U.S. REPORTEDLY COMES FROM THE FORD COMPANY; THEY TAKE 60 MONTHS FROM DRAWING BOARD TO COMPLETED PRODUCT. THE U.S. STILL RANKS AT THE TOP WHEN IT COMES TO CREATIVITY, BUT WE TAKE TOO LONG TO GET TO THE MARKET WITH OUR PRODUCTS.

WE OF THE AEROSPACE INDUSTRY HAVE BEEN CONCERNED ABOUT THE INADEQUACIES OF OUR R&D PROCESS FOR SOME TIME AND DECIDED THAT SOMETHING HAD TO IMPROVE BEFORE IT WAS TOO LATE.

THE AEROSPACE INDUSTRIES ASSOCIATION HAS SPONSORED THE DEVELOPMENT OF A NEW APPROACH, THE KEY TECHNOLOGIES FOR THE 1990S PROGRAM. IT SEEKS TO MAKE THE EXPENSIVE PROCESS OF TECHNOLOGY DEVELOPMENT MORE AFFORDABLE BY TAKING ADVANTAGE OF THE MOMENTUM AND EFFICIENCIES INHERENT IN A NATIONAL COOPERATIVE PROGRAM. IT AIMS TO

DO SO BY HARNESSING AND STIMULATING THE GREAT WEALTH OF LATENT CAPABILITY THAT ALREADY EXISTS IN THIS COUNTRY.

THIS PROGRAM INVOLVES FOCUSED DEVELOPMENTAL EFFORT ON A NUMBER OF KEY TECHNOLOGIES SELECTED ON THE BASIS OF HIGHEST LEVERAGE, GREATEST POTENTIAL PAYOFF AND BROADEST APPLICABILITY TO BOTH CIVIL AND MILITARY PRODUCTS. EACH KEY TECHNOLOGY MUST BE AFFORDED PRIORITY AND MUST BE DEVELOPED ON AN ACCELERATED BASIS AS A NATIONAL INITIATIVE OF INDUSTRY, GOVERNMENT AND ACADEMIA: EACH CONTRIBUTING ITS SPECIAL CAPABILITIES IN A CLOSELY COORDINATED TEAM EFFORT.

BY BRINGING THESE TECHNOLOGIES TO MATURITY ON AN ACCELERATED SCHEDULE AND APPLYING THEM TO ADVANCED PRODUCTS AHEAD OF OUR COMPETITORS, THE U.S. WILL GAIN ENORMOUS BENEFIT NOT ONLY IN TRADE COMPETITIVENESS BUT IN NATIONAL SECURITY. AND BECAUSE OF THE BROAD APPLICABILITY OF THE TECHNOLOGIES SELECTED, THE BENEFITS EXTEND BEYOND THE AEROSPACE/DEFENSE INDUSTRY TO MANY OTHER INDUSTRIES. THESE TECHNOLOGIES ARE ALL DUAL-USE IN THAT THEY ARE APPLICABLE TO BOTH GOVERNMENT AND COMMERCIAL PRODUCTS. I SAY DUAL USE TECHNOLOGIES, BUT I'M SPEAKING HERE ABOUT TECHNOLOGY WHICH, BY AND LARGE, CAN BE APPLIED TO MANY AND VARIED PROBLEMS. FOR EXAMPLE, THE FREE ELECTRON LASER IS BEING STUDIED IN THE SDI PROGRAM FOR POTENTIAL USE AS A DIRECTED ENERGY WEAPON. HOWEVER, THE PRECISION CONTROL OF POWER OUTPUT AND PULSE STRUCTURE COMBINED WITH THE ABILITY TO VARY FREQUENCY MAKES IT USEFUL IN MEDICINE AS WELL. PHOTODYNAMIC THERAPY, A PROCESS WHEREBY A NON-TOXIC PHOTOACTIVE DYE IS INSERTED INTO TISSUE AND ABSORBED BY MALIGNANT TISSUE, ALLOWS FOR IDENTIFICATION, DIAGNOSIS AND REMOVAL (OR DESTRUCTION) OF TUMORS AT AN EARLY STAGE. THERE IS ALSO EVIDENCE THAT A NUMBER OF VIRUSES ARE SUSCEPTIBLE TO LASER-INDUCED PHOTODYNAMIC PROCESSES, AND THE POSSIBILITY OF A VIRUS FREE BLOOD BANK IS BEING EXPLORED. SIMILARLY, HIGH POWER LASER ENERGY HAS NUMEROUS APPLICATIONS IN ADVANCED MANUFACTURING METHODS.

UNDER THE AIA KEY TECHNOLOGIES PLAN, THE TECHNOLOGY DEVELOPMENT AND INTEGRATION PROCESS WILL BE SUBSTANTIALLY IMPROVED OVER THE TRADITIONAL PROCESSES I DESCRIBED, BUT WILL STILL TAKE ADVANTAGE OF THE FREE ENTERPRISE COMPETITIVE APPROACHES THAT ARE FUNDAMENTAL TO ITS SUCCESS.

UNDER ONE ASPECT OF THE AIA PROPOSAL, HOWEVER, INDUSTRY, RESEARCH UNIVERSITIES AND GOVERNMENT LABORATORIES WOULD FUNCTION AS A COORDINATED TEAM, EACH CONTRIBUTING TO THE GENERIC TECHNOLOGY BANK FROM BASIC RESEARCH THROUGH THE TECHNOLOGY DEVELOPMENT PHASE -- THUS AVOIDING COSTLY DUPLICATION AND REDUCING RISK BEFORE ANY ATTEMPT IS MADE TO APPLY THE TECHNOLOGY TO A PRODUCT. THIS PRE-COMPETITIVE COOPERATION WOULD AVOID UNWARRANTED DUPLICATION OF EFFORT AND PROVIDE A BROADER TECHNOLOGY BASE IN KEY AREAS OF WORK. AN EXAMPLE OF THIS IS THE COMPOSITE MATERIALS CHARACTERIZATION CONSORTIUM, WHERE A NUMBER OF COMPANIES ARE POOLING THEIR RESOURCES IN A JOINT EFFORT TO EVOLVE THE BASIC TECHNOLOGY DATA NEEDED FOR MATERIAL SCREENING.

WHEN A TECHNOLOGY REACHES A "REASONABLE RISK" STATE OF MATURITY, INDUSTRY PARTICIPANTS WILL INDIVIDUALLY PURSUE THEIR OWN PRODUCT DEVELOPMENT EFFORTS IN A COMPETITIVE ENVIRONMENT, BUT ONE THAT IS CONDUCIVE TO STIMULATING AND ACCELERATING THE OVERALL PROCESS.

AIA BELIEVES THAT THE NATIONAL TECHNOLOGY DEVELOPMENT APPROACH COULD EFFECT A TWO-TO-ONE INCREASE IN THE PRODUCTIVITY OF AVAILABLE RESOURCES AND CUT IN HALF THE TIME IT TAKES TO DEVELOP AND FIELD TECHNOLOGY. MOST IMPORTANTLY, THIS PROGRAM AIMS TO MAKE AVAILABLE -- BEFORE THE TURN OF THE CENTURY -- THE TECHNOLOGICAL TOOLS AMERICAN INDUSTRY NEEDS TO COMPETE MORE EFFECTIVELY.

LET ME EMPHASIZE THAT KEY TECHNOLOGIES IS NOT JUST A PROPOSAL BUT AN ACTIVE PROGRAM ON WHICH AIA HAS BEEN WORKING FOR THE PAST THREE YEARS. I HAVE INCLUDED FOR THE RECORD MATERIAL DESCRIBING SOME INDIVIDUAL TECHNOLOGIES AND AN OVERVIEW BROCHURE ON THE KEY TECHNOLOGIES PROGRAM.

IN JANUARY, AIA TOOK ANOTHER MAJOR STEP TOWARD REALIZING A NATIONAL TECHNOLOGY DEVELOPMENT STRATEGY WITH THE ESTABLISHMENT OF THE INDUSTRY-SPONSORED NATIONAL CENTER FOR ADVANCED TECHNOLOGIES (NCAT). NCAT IS REAL EVIDENCE OF THE AEROSPACE INDUSTRY'S RECOGNITION OF THE IMPORTANCE OF THE TECHNOLOGY DEVELOPMENT PROCESS AND ITS COMMITMENT TO ADVANCING THE PROCESS.

NCAT HAS TWO MAJOR RESPONSIBILITIES: IT WILL HANDLE THE DAY-TO-DAY COORDINATION OF THE KEY TECHNOLOGIES PROGRAM, AND IT WILL SERVE AS A DATA REPOSITORY FOR PROGRAM DECISION-MAKING. ITS INITIAL ASSIGNMENT IS TO PULL TOGETHER EVERYTHING THAT IS BEING DONE IN THE KEY TECHNOLOGY AREAS, CREATING AN UP-TO-THE-MINUTE, SPECIALIZED DATA BASE OF GREAT VALUE TO THOSE COMPANIES AND GOVERNMENT AGENCIES PARTICIPATING IN THE PROGRAM.

WE ARE DEVELOPING ROADMAPS FOR EACH OF THE KEY TECHNOLOGIES. WE HAVE ALREADY COMPLETED FOUR OF THEM (ROCKET PROPULSION, ADVANCED SENSORS, ARTIFICIAL INTELLIGENCE, AND SOFTWARE DEVELOPMENT), AND FOUR MORE ARE IN COORDINATION (AIRBREATHING PROPULSION, ADVANCED COMPOSITES, ULTRA-RELIABLE ELECTRONIC SYSTEMS AND OPTICAL INFORMATION PROCESSING), AND TWO ARE JUST STARTING (SUPERCONDUCTIVITY AND COMPUTATIONAL SCIENCE). IN ADDITION TO THE INDIVIDUAL TECHNOLOGIES, WE HAVE ALSO WORKED ON POLICY DEVELOPMENT THROUGH THE AEROSPACE TECHNOLOGY POLICY FORUM. THE GROUP CONSISTS OF THE TOP LEVEL INDUSTRY-GOVERNMENT-ACADEMIA POLICY MAKING PERSONNEL THAT WILL PROVIDE OVERALL DIRECTION OF THE PROGRAM. LAST YEAR WE WERE ABLE TO ENLIST THE SUPPORT OF UPPER LEVEL REAGAN ADMINISTRATION OFFICIALS

REPRESENTING THE MAJOR TECHNOLOGY DEVELOPING AGENCIES. WE REQUEST THAT THE LIST OF NAMES COMPRISING THIS AEROSPACE TECHNOLOGY POLICY FORUM BE INCLUDED IN THE RECORD. WE MUST NOW REBUILD THE FORUM TO INCLUDE THEIR SUCCESSORS IN THE BUSH ADMINISTRATION. ONCE THAT TASK IS ACCOMPLISHED, WE WILL BEGIN IN EARNEST THE IMPLEMENTATION OF THE KEY TECHNOLOGIES PROGRAM.

OUR NEXT STEPS INVOLVE PREPARATION OF NATIONAL TECHNOLOGY DEVELOPMENT PLANS FOR EACH OF THE KEY TECHNOLOGIES AND THE CREATION OF PLANS FOR TECHNOLOGY VALIDATION DEMONSTRATIONS TO ENSURE APPLICATIONS OF THE TECHNOLOGY.

WITH THIS PROGRAM, THE AEROSPACE INDUSTRY HAS TAKEN THE LEADERSHIP IN ADVANCING TECHNOLOGY DEVELOPMENT. WE THINK OUR PROGRAM IS AN EXCELLENT MODEL FOR OTHER U.S. INDUSTRIES TO FOLLOW. WE HAVE THE COOPERATIVE EFFORT STARTED, BUT THE PROGRAM FOR THE NEXT FEW YEARS WILL STILL REQUIRE ENCOURAGEMENT AND NURTURING. WE NEED TO PROVIDE A STABLE ENVIRONMENT TO HELP DEVELOP A NATIONAL CONSENSUS ON TECHNOLOGY DEVELOPMENT AND TO PUT IN PLACE A NATIONAL TECHNOLOGY STRATEGY.

LET ME EXPAND JUST A LITTLE ON THAT. FIRST AND FOREMOST, WE NEED TO ENSURE A STRONG NATIONAL TECHNOLOGY BASE THROUGH THE LONG TERM. WE NEED TO CHANGE OUR OUTLOOK FROM SHORT TERM TO LONG TERM AND PLAN OUR INVESTMENTS ACCORDINGLY. WE NEED TO RECOGNIZE THAT TECHNOLOGY DEVELOPMENT IS IMPORTANT AND THAT FILLING THE GAP BETWEEN RESEARCH AND APPLICATION WILL REQUIRE RESOURCES (PEOPLE, MONEY, TIME AND FACILITIES). WE NEED TO MAKE SURE THOSE RESOURCES ARE PROVIDED IN SUFFICIENT QUANTITIES TO GET THE JOB DONE AND THAT THE NATIONAL TECHNOLOGY BASE IS ADEQUATELY SUPPORTED. GIVEN THAT, WE CAN TALK ABOUT PRIORITIES, OR COOPERATIVE EFFORTS, ON GIVEN TECHNOLOGIES. A COMPARISON OF AIA'S KEY TECHNOLOGIES VS. AGENCY PRIORITIES IS INCLUDED FOR THE RECORD. WHERE THERE IS CONSENSUS ACROSS AGENCIES AND WITH INDUSTRY AND ACADEMIA, WE SHOULD BE ABLE TO MARSHAL THOSE

RESOURCES INTO A NATIONAL TECHNOLOGY DEVELOPMENT EFFORT. THAT IS WHAT AIA'S PROGRAM IS ABOUT.

THE CONCEPT IS EASILY UNDERSTOOD, BUT THE IMPLEMENTATION NEEDS A POLICY ENVIRONMENT THAT WILL ALLOW IT TO HAPPEN EASILY AND WITHOUT ROADBLOCKS OR BARRIERS. THE FOLLOWING POINTS WILL DESCRIBE SOME OF THE THINGS WE FEEL WOULD ENCOURAGE THE TECHNOLOGY DEVELOPMENT PROCESS.

AIA SUPPORTS BIENNIAL BUDGETING AND EXPANDED MULTIYEAR PROCUREMENT. THIS WOULD PROVIDE MORE STABILITY FOR INDUSTRY'S TECHNOLOGY DEVELOPMENT EFFORTS.

THE GREATEST PRESSURE ON GOVERNMENT CONTRACTORS IS THE NEED TO ENSURE ADEQUATE PROFIT LEVELS TO ALLOW FOR INDUSTRY LONG TERM INVESTMENTS. ANY HIGH TECH INDUSTRY WILL WITHER IF IT CANNOT PROVIDE FOR LONG TERM R&D AND THE ABILITY TO DEVELOP NEW TECHNOLOGY TO RISK-ACCEPTABLE READINESS. PROBLEMS HERE INCLUDE FIXED PRICE DEVELOPMENT CONTRACTS AND FORCED COST SHARING.

OF PARTICULAR IMPORTANCE TO GOVERNMENT CONTRACTORS IS INDEPENDENT RESEARCH AND DEVELOPMENT OR IR&D. IR&D IS COMPANY-INITIATED R&D THAT EXPLORES ADVANCED CONCEPTS AND CREATES NEW PRODUCTS AND PROCESSES THAT MAKE A COMPANY MORE COMPETITIVE. IT IS A COMPANY'S INVESTMENT IN ITS FUTURE, AND IS, IN AIA'S VIEW, THE VERY BEST EXISTING MECHANISM FOR NEW TECHNOLOGY DEVELOPMENT LEADING TO SUPERIOR U.S. AEROSPACE PRODUCTS. THE GOVERNMENT SHOULD RECOGNIZE THAT IR&D IS A NORMAL COST OF DOING BUSINESS AND INDUSTRY SHOULD BE ABLE TO ALLOCATE TO THE GOVERNMENT ITS FULL SHARE OF ACTUAL IR&D/B&P COSTS WITHOUT CEILING LIMITATIONS. NORMAL COMPETITIVE PRESSURES PROVIDE A VERY EFFECTIVE AND PROVEN MEANS FOR ENSURING THAT IR&D/B&P COSTS ARE MAINTAINED AT REASONABLE LEVELS.

ANOTHER MAJOR NEED IS SIMPLIFICATION OF THE FEDERAL ACQUISITION SYSTEM. DOD HAS, OVER THE PAST TWO YEARS, INSTITUTED A NUMBER OF STREAMLINING MEASURES, BUT A LOT REMAINS TO BE DONE. AIA BELIEVES, AS DID THE PACKARD COMMISSION, THAT A GREATLY SIMPLIFIED, MORE CONSISTENT PROCUREMENT PROCESS WOULD ENABLE US TO CUT IN HALF THE TIME IT TAKES TO DEVELOP, PRODUCE AND FIELD A MAJOR WEAPON SYSTEM; THAT WOULD MEAN ENORMOUS SAVINGS TO THE GOVERNMENT. CARRIED JUST A BIT FURTHER, WE BELIEVE THAT TECHNOLOGY CONTRACTING SHOULD BE CONSIDERABLY SIMPLIFIED AND GIVEN PRIORITY ATTENTION TO REDUCE PROCUREMENT TIMES AS MUCH AS POSSIBLE.

ADDITIONALLY, DOD SHOULD DEVELOP A FIRM AND CONSISTENT POLICY THAT CLARIFIES TECHNICAL DATA RIGHTS AND PROTECTS INDUSTRY'S PROPRIETARY RIGHTS TO INTELLECTUAL PROPERTY.

AS INCENTIVES, TAX CREDITS FOR R&D SHOULD BE EXPANDED. THE TAX CREDIT SHOULD BE MADE PERMANENT IN ORDER TO PERMIT LONG TERM PLANNING. IT SHOULD BE MADE AVAILABLE TO SUPPORT COMPANIES WHO INVEST AT CONSISTENT LEVELS. (IT CURRENTLY ONLY BENEFITS COMPANIES WHOSE R&D INVESTMENT INCREASES.) IT SHOULD ALSO BE MADE AVAILABLE TO NEW AND SMALL BUSINESSES. THERE SHOULD BE A SPECIAL TAX CREDIT TO INCENTIVIZE COOPERATIVE EFFORTS BETWEEN INDUSTRY AND THE ACADEMIC COMMUNITY.

WE BELIEVE THERE IS ALSO A NEED TO PROVIDE FOR ADEQUATE KEY TECHNOLOGY VALIDATION DEMONSTRATIONS. ALL OF US, THOSE IN THE AEROSPACE INDUSTRY, THE GOVERNMENT TECHNOLOGY FOLKS, AND THE UNIVERSITY EXPERTS NEED TO AGREE ON WHAT THOSE VALIDATION DEMONSTRATIONS ARE, AND WHICH ARE OF THE HIGHEST PRIORITY. THE GOVERNMENT SHOULD PROVIDE THE FRAMEWORK TO SEE THAT THE MOST CRITICAL VALIDATION DEMONSTRATIONS ARE PERFORMED WELL BEFORE MAJOR DEVELOPMENT PROGRAMS ARE STARTED.

TECHNOLOGY VALIDATION DEMONSTRATIONS ARE THE PROOF OF CONCEPT

EFFORTS THAT DEMONSTRATE THAT COMPONENTS OR SUBSYSTEMS NOT YET READY FOR PRODUCTION CAN BE MADE TO WORK TOGETHER WELL. I WOULD CATEGORIZE THESE AS "BREADBOARD" DEMONSTRATIONS AND ALSO "BRASSBOARD" DEMONSTRATIONS WHICH ARE MORE OF A PROTOTYPE NATURE (MORE REFINED THAN LABORATORY DEMONSTRATIONS BUT STILL NOT AT A PRODUCTION STAGE). THESE VALIDATION DEMONSTRATIONS ARE IMPORTANT IN THAT THEY WILL REDUCE RISK AND IMPROVE RELIABILITY AND MAINTAINABILITY OF LATER DESIGNS WHEN THEY GO TO PRODUCTION. THESE COULD BE DONE AT GOVERNMENT LABORATORIES OR IN INDUSTRY FACILITIES. MORE COMPLETE VALIDATIONS, SUCH AS THE TEST OF A ROCKET ENGINE FOR THE ADVANCED LAUNCH SYSTEM, SHOULD PROBABLY BE FUNDED BY THE MAJOR SYSTEMS PROGRAM.

ANOTHER CONCEPT WHICH HAS THE POTENTIAL FOR SPEEDING UP THE R&D PROCESS IS CALLED "CONCURRENT ENGINEERING". IT MEANS WHILE YOU ARE DEVELOPING THE TECHNOLOGY FOR A NEW SYSTEM, YOU ALSO WORK ON THE MANUFACTURING TECHNOLOGY AND PROCESS DEVELOPMENT TO ENSURE THE USE OF THAT TECHNOLOGY AT THE LOWEST RISK AND COST, BUT WITH THE GREATEST EFFICIENCY. WE HAVE BEGUN TO INCORPORATE PRODUCIBILITY CONSIDERATIONS AND CONCURRENT ENGINEERING WITH OUR KEY TECHNOLOGIES EFFORT.

I BELIEVE THAT TECHNOLOGY INTEGRATION DEMONSTRATIONS CAN ALSO SPEED THE EVENTUAL USE OF TECHNOLOGY. OUR KEY TECHNOLOGIES EFFORT SELECTED WHAT THE AEROSPACE INDUSTRY CONSIDERED SYNERGISTIC TECHNOLOGIES - THOSE, WHICH IF CAREFULLY NURTURED, WOULD PROVIDE NEW CAPABILITIES FOR FUTURE AEROSPACE PRODUCTS. THE LINCHPIN OF SUCCESS IS INTEGRATION OF THESE TECHNOLOGIES, AND A DEMONSTRATION THAT THEY INDEED WORK TOGETHER IS "PROOF OF THE PUDDING." THE NATIONAL AEROSPACE PLANE (NASP) IS AN EXCELLENT EXAMPLE HERE. THE CONCEPT WAS DEVELOPED THROUGH A NATIONAL CONSENSUS AND WITH THE PARTICIPATION OF APPROPRIATE "EXPERTS." THE TECHNOLOGIES OF MATERIALS, STRUCTURES, PROPULSION, AERODYNAMICS AND COMPUTING ARE

BEING DEVELOPED NOW AND COULD RESULT IN A TOTALLY NEW NATIONAL CAPABILITY FOR THE U.S.

I THINK WE NEED TO VISUALIZE THE SAME KIND OF PROCESS FOR A FEW MORE TECHNOLOGY INTEGRATION DEMONSTRATIONS OF A NATIONAL NATURE THAT GO BEYOND THE SCOPE OF INDIVIDUAL AGENCY MISSION BOUNDARIES.

AND LAST, BUT CERTAINLY NOT LEAST, IS THE NEED TO BUILD A BETTER SCIENCE EDUCATION INFRASTRUCTURE THROUGH INCENTIVES FOR TEACHING AT ALL EDUCATION LEVELS. THERE IS A NEED TO DEVELOP PROGRAMS AT THE COLLEGE LEVEL FOR NEAR TERM BENEFITS, BUT STUDENTS MUST BE PREPARED THROUGH BETTER ELEMENTARY AND SECONDARY EDUCATION PROGRAMS BEFORE THEY GET TO COLLEGE. THE MATH AND SCIENCE EDUCATION EFFORTS ARE OBVIOUS CHOICES FOR EMPHASIS, BUT COMMUNICATION SKILLS AND FOREIGN LANGUAGE SKILLS ARE ALSO IMPORTANT. THIS PROBLEM IS PARTICULARLY ACUTE FOR THE AEROSPACE INDUSTRY WHICH IS ALREADY INTERNATIONAL IN SCOPE.

IN SUMMARY, WE NEED A NEW NATIONAL APPROACH TO SUCCESSFULLY COMPETE IN TOMORROW'S WORLD.

WE BELIEVE THE ESSENTIAL INGREDIENTS ARE:

- SIGNIFICANT GOALS - I.E., DOUBLE THE PRODUCTIVITY OF AVAILABLE RESOURCES AND HALVE THE TIME FROM IDEA TO USE;
- INDUSTRY PLAYING A KEY ROLE IN A COOPERATIVE PARTNERSHIP WITH GOVERNMENT AND ACADEMIA;
- FOCUS ON THE KEY TECHNOLOGIES PROVIDING HIGHEST ECONOMIC LEVERAGE; AND

- O A POSITIVE POLICY ENVIRONMENT TO ENCOURAGE THE SUCCESS OF A NEW U.S. TECHNOLOGY DEVELOPMENT PROCESS.

WE THINK KEY TECHNOLOGIES FOR THE 1990S CAN PRODUCE THE CHANGES OUR NATION NEEDS TO MAKE IF WE ARE TO REMAIN COMPETITIVE. IN ADDITION, WE FEEL THE PROGRAM IS FAR ENOUGH ALONG TO BE USED AS A MODEL FOR OTHER INDUSTRIES.

WE ARE ENCOURAGED BY THE INCREASING NATIONAL INTEREST IN TECHNOLOGY DEVELOPMENT. WE WANT TO WORK WITH THE ADMINISTRATION, AND CONGRESS TO IMPROVE OUR INDUSTRIAL COMPETITIVENESS IN THE INTERNATIONAL MARKETPLACE AS WELL AS CONTINUING OUR TECHNOLOGICAL SUPERIORITY IN MILITARY SYSTEMS.

THAT CONCLUDES MY PRESENTATION. I WILL NOW RESPOND TO ANY QUESTIONS YOU MAY HAVE.

Senator BINGAMAN. Thank you very much. I will start with a few questions for Mr. Galvin.

SETTING A NATIONAL GOAL

Your idea about trying to set a national goal, or a goal for the Department of Defense, as I understand it, of being a world-class customer and emphasizing quality and reliability and total cycle time goals to do that is very intriguing.

I guess I am still unclear, though, as to how you would see the Congress bringing this about or causing this to happen. We in Congress are often accused of micromanaging, and of getting so much into detail that we hamstring the executive branch in that we take away from them the flexibility to do what they need to do.

Are you suggesting that the Congress legislate some goals? Or are you suggesting some goals as to productivity improvements, as to reduction in life cycles to get these products from concept to actual application?

What are you suggesting Congress can do in concrete terms to accomplish what you are proposing?

Mr. GALVIN. Let me start with the philosophy of how one motivates an organization or tries to change it. With the current system we are attempting to fix a brick at a time, a program at a time. That is one way of doing it, because once all of the programs are fixed, you can then add up the aggregate improvements and measure the total performance.

Another strategy, which is one that is working we think, more effectively for our institution, is to set an overriding goal and let the institution fix itself from within. All kinds of things have to change within the procedures, the bureaucracies, the regulation, the way interface with each other, in order to achieve these goals when you combine quality and reliability and cycle time.

The specific form of legislation I will have to leave in the able hands of the Congress in terms of choosing what you perceive might be the most effective. The idea, though, is to put yourselves out of the mode of necessarily having to fix it yourself or asking people to come in from the outside and make recommendations as to how it should be fixed, and act somewhat like the board of directors of an institution and set an overriding objective and let people then figure out how to accomplish it.

Therefore the specific suggestion is to create a policy-like legislation that says that by the year 2000 you will achieve virtual perfection. It can be measured, by the way, very accurately statistically using the concept of mathematics called statistics, which is now very well proven. The Japanese and many companies around the United States are applying statistical process control, and measurements of reliability, which are now well established, and including measures of cycle time.

Set those as goals and then allow the institutions to come to you and say, "In order to meet the goal by 1994 of 4 Sigma, these are the changes I have to make in regulations, in audit procedures, and in how I select vendors, et cetera. Please give me a fast turnaround on legislation that allows me to fix things from within." Have the bureaucracy and the institution help in addition to the kinds of suggestions that are made here.

It is not unlike the Kennedy example. Most people did not believe that it was possible. People in Motorola did not believe this quality was possible until we began engaging the process.

I did not mention the concept of the cost of quality. The cost of quality is measured in institutions somewhere between 8 to 20 percent of total revenues. It is the cost of doing things wrong or not doing things right the first time.

At Motorola we estimated it to be about 8 to 10 percent. That is about $800 million, the cost of quality in our institution given last year's sales revenues. We believe that in the first 2 years we have eradicated or eliminated enough failures that our cost of quality has been reduced by $250 million.

Quality does not cost money. It saves money. I am suggesting you set the goal to put people in motion pursuing it.

Senator BINGAMAN. If we pursue this, set goals, you are suggesting we set them in a variety of very specific areas so that they would be measurable, and then we would get an annual accounting. Presumably, we would have somebody come forward and say this is where we are, this is where we are falling short, and all of that.

Mr. GALVIN. The process for monitor and control is one that would have to be fleshed out, but the basic concepts are the following.

One, without adding any money to the Federal budget in terms of expenditures for defense, you can use the budget process to direct resources into those activities that are accomplishing the results.

Second, you have the power of appointment approval. Why shouldn't 30 percent of the evaluation of an appointee in 1994 be what that person—who is going to be assigned to the Defense Department in some administrative or executive capacity, or a person who is in some command level at the Army, the Joint Chiefs of Staff, what have you—has accomplished in the process of seeking perfection? What have they done to improve quality in their area, or what credentials do they bring to improve that particular area? You can control the appointment process.

You also have this reporting phenomenon. You can bring people in to testify. You can ask for specific reports. Again, to make the comment that some people say, "Gee, isn't it easy to fool people with statistics?" The answer is no, from a simple standpoint that, one, the mathematics of statistics is very precise. What you end up doing is asking people to put in the numerator of a fraction—what the defects or the failures are in every mode.

Just as an example, we measured journal entries in accounting. We have changed the patent process using these procedures. You put the defects in the numerator and the opportunities for error (or defects) in the denominator. By just asking people to begin to identify what are all the possible defect modes, they begin figuring out ways to improve what they are doing, and they begin thinking of significant changes to the system that have to occur in order to accomplish the goal.

Senator BINGAMAN. My time is up. Let me call on Senator Wallop.

Senator WALLOP. Thank you, Mr. Chairman. May I say to both of our witnesses that is an interesting challenge. I am frustrated as I look at the challenge because I see its promise and yet I also know Congress. I do not know how we would ever get ourselves to stay hitched to a wagon for 7 years.

I know the importance of it. I can see it and I can sense the value that you bring to it, but there is another problem.

DOD CHANGING REQUIREMENTS

Mr. Longuemare, let me ask you. One of the things about which I continually hear contractors express frustrations are the changing requirements of DOD as the process moves along. All of the sudden what you set out to do is not nearly good enough. I have referred to it as technological navel gazing. We are always so fascinated by what we can do tomorrow that we never get anything done today.

But something has to happen in the way DOD looks at things, too, before this would work, would it not?

Mr. LONGUEMARE. I believe this is all part of the whole procurement process, which is a very complex one. From our experience, what you are talking about here is the fact that it is very difficult to understand what the latest capability is and what the latest technology is in a smart manner to be able to really define what those requirements should be in great detail.

I think one of the problems that exists is that there has been an attempt in many cases to over-define the "how-to" as opposed to just requesting what is desired.

I think the best thing that could be done here is to have the procurement process stay away from telling people how to do it because, frankly, that is something that needs to be developed. That is part of this whole process of technology evolution; you have all these thousands and thousands of smart people out there continuously evolving new ways of doing things. They are a lot smarter than anybody else.

If you could just challenge that group to be able to solve problems by defining the problems, as opposed to defining the way to solve them, I think that would be the best solution to that whole process.

Senator WALLOP. Do not give them a roadmap. Give them a destination.

Mr. LONGUEMARE. Yes, sir. Absolutely.

Senator WALLOP. I gather then, that this is the concept behind your technology bank. That in there are the keys, the pathways which lead ultimately to final goals.

But in order for that to function fully do we have to do something about antitrust restrictions?

Mr. LONGUEMARE. Well, of course, that is something that is going in a counter-direction to what we are talking about here because our whole approach is to try to get a cooperative environment between industry and government, in particular, and with academia. In many quarters, as you know, that is frowned upon these days. But I do not know how you can go about solving a problem well unless there is a great deal of cooperation there.

The same thing is true between various industries. There are many cases where in some of the base technologies it is to everybody's advantage for various industries who normally compete in these major product areas to combine their activities at the base research stage to try to pool capabilities to come with an enhancement of the overall state of the art.

When this base technology gets to the point where it can then spin off into actual products, then it can be competed in the normal way. There is such a tremendous amount of funding required these days sometimes in large investments and equipment, that if you can pool these capabilities, there is a major advantage.

Now, the other point, too, is that our competitors in the foreign arena do not have this problem. They are very much backed up first by their goverments and, of course, they are very monopolistic in their whole approach to things. So the game we are fighting right now is very imbalanced in that respect.

I believe that without any real problem to the American system, if we can get some recognition of the desirability of this, that would certainly be a move in the right direction.

PURSUIT OF QUALITY

Senator WALLOP. Part of your pursuit of quality comes from what you said was a key validation demonstration program. Is there such a function now within DOD or should we look toward establishing such a function

Mr. LONGUEMARE. Well, I believe there are several instances where this has been done, and in those cases it has also been very successful. Let me just take a minute and try to describe part of the problem here.

There is a huge variety of technologies that are all being worked on. There is some merit, incidentally, in having a little bit of duplication because no one necessarily has all of the right answers. So, to have several people working on some of these things is certainly desirable.

The problem right now, in many respects, is that because this is all contracted by a whole multitude of different agencies, you end up in many cases with a lot of solutions looking for problems. People come up with technological marvels, but they are not necessarily aimed at some ultimate goal in any kind of a coordinated way.

What we are talking about in terms of some of these demonstrations, is to pull together combined sets of these various capabilities, using, for example, a roadmap—that is part of our whole process, to put together a set of roadmaps showing how one would take these various technologies and put them together into some ultimate system that achieves a purpose. These demos, for example, would then be the means by which that process could be validated.

So, it is all part of the process. I can give you an example of a specific program I am familiar with in the avionics area. That is the INEWS program, the integrated new electronic warfare system, which is one of the very few that I am aware of that started out in the very beginning to look at an entire problem area. It looked at all the various assets that were involved and it approached this whole process on a very long-range basis.

As a consequence, it is coming up with a set of alternatives and a set of new technologies that are going to be integrated and represent a major step forward.

This is the kind of demonstration-type program that I think would be very useful if it were proliferated.

Senator WALLOP. Thank you. Mr. Chairman, my time is up. I just want to thank these two gentlemen again.

Mr. Galvin, at some moments—it is not my time and I do not want you to answer this now—but you cite that total quality management as a step in the right direction but then cite its inadequacies. You might take time at some moment to address what is wrong with it and how it might be directed a little better toward the goals that you seek.

Thank you.

Senator BINGAMAN. Senator Wirth.

Senator WIRTH. Thank you very much, Mr. Chairman. Gentlemen, thank you for being here.

Mr. Galvin, please give my best to your father who helped me get through graduate school a long time ago. I appreciate that.

Mr. Longuemare, I worked for Don Fuqua for many years on the House side. Give him my greetings. Will you do that?

Now, let me ask you a set of parallel questions, and then I want to follow with a question about personnel to make all of this happen.

GOVERNMENT INTERFERENCE IN THE MARKETPLACE

First of all, how does what you are suggesting, Mr. Longuemare, differ from what we did with Sematech? Second, how do you get around the question that is asked by many of our brethren up here that what we are doing is either picking winners and losers, or what you are suggesting is excessive Government interference in the marketplace?

Mr. **Longuemare**. The example of Sematech, of course, is a very good indication of how there has been a recognition of a national problem that is being addressed in a major way by cooperation between industry and government.

I think this is a specific case where a very major area is being addressed. It is certainly in the spirit of what we are talking about here.

Senator **Wirth**. Sematech is an example of what we ought to be doing in the model you are talking about? Is that right?

Mr. **Longuemare**. I would say that that is one aspect of it, but certainly not the only thrust that is involved here. I believe that is one where you can address certain specific problems. But what we are talking about, really, in terms of this whole technology for the 1990s is a more global thrust from the standpoint of addressing a large variety of new technologies, many of which would not necessarily be amenable to the precise approach of Sematech.

Senator **Wirth**. Sematech was more of a specific package. We picked an issue and I think it is exactly what we ought to be doing.

Mr. **Longuemare**. Yes.

Senator **Wirth**. Senator Bingaman and I spent a lot of time nurturing Sematech.

That is a specific item. What you are talking about is taking a number of long-term technologies and setting a goal for their achievement. Is that right?

Mr. **Longuemare**. Yes, that is correct.

Senator **Wirth**. Then, you hope that DOD, working with the academic world and the private sector, can get from where we are now to that goal.

Mr. **Longuemare**. Well, we would hope that it would be more than just hoping that would be the result there. That we would actually actively participate in some forum. Of course, this National Center for Advanced Technologies that we've already started is a mechanism at least to focus the industry efforts. But I think that what is needed is some pressure from the legislative side and also acknowledgement that this thrust is a desirable thing.

I believe the key factor would be to provide some real incentive process. I think the idea of providing money to go do something is a desirable thing perhaps. But a better way to do it is to find some way to incentivize this group so that if they are successful, there can be some rewards. That is the real way to get some success here.

Senator WIRTH. Let me ask you this: How do you get around the issue of—if we presume we wanted to pursue this—people coming out of the woodwork saying that Federal Government should not be involved in this? After all, you are picking winners and losers, and many people believe that only the free market should do that. Who are you all to believe that you can make these kinds of choices?

Mr. LONGUEMARE. You mean in terms of who would be participating in the development of this?

Senator WIRTH. I mean, I have never really quite understood what the basic problem was, but Americans have this ideological fix against the Government getting involved in pursuing certain technologies. We hear particularly from the ideological right that somehow the Federal Government cannot get involved in this sort of thing because it is "picking winners and losers" and only the free market can do that. The heavy hand of Uncle Sam will destroy development rather than nurture it. You have heard all of the rhetoric.

Mr. LONGUEMARE. Oh, yes.

Senator WIRTH. How do you get around that? If we were to bring this proposal out on the floor of the Senate or on the floor of the House, we would find a cacophony of shrill opposition saying that this was excessive Government interference in the marketplace and we ought to let the free hand of Adam Smith guide us rather than a number of green eyeshade bureaucrats at the Department of Defense. That is defining it excessively, of course.

Mr. LONGUEMARE. Yes.

Senator WIRTH. Mr. Galvin, you have heard all these arguments?

Mr. GALVIN. Right.

Senator WIRTH. How do we work our way around this set of very real political and rhetorical barriers?

Mr. GALVIN. Trying to change people's minds on those philosophical issues is obviously very difficult in this case. Although I will suggest that the process of steering capital towards different productive uses on a planned basis has been going on in the Defense Department for a long time. It has supported many developments of technologies. Just not enough perhaps in the areas that are of interest to those testifying here.

The reality of the world is that our major regional competitors, Europe and Japan, have adopted a policy to steer capital into areas of developing technology, improving quality and building their industrial base.

The analogy is rather simple. We agree with the principles of Adam Smith, but we also face this kind of situation: Imagine a football coach who is facing a team where the other coach asks his students or athletes to lift weights for 3 hours a day and train for another 2 or 3 hours a day. They build up a front line of 220 or 230 pounds on average in that particular high school. The opposing coach, says, "I do not believe in lifting weights and I do not believe asking my kids to train 3 hours a day," or what have you. He ends up with a 180-pound front line and an agile set of plays. When you go into that football game, who is going to be able to open up a hole for the halfback?

The analogy is basically the same in world competition.

Senator WIRTH. Right.

Mr. GALVIN. And you have heard these stories as much as we have.

Senator WIRTH. Right. I appreciate it. I think it is very useful you all are here making this kind of a case. The notion of steering capital is certainly also one that is not new in our Nation's history.

Mr. GALVIN. Right.

Senator WIRTH. For example, we steered capital when we decided to build the canals or build the railroads across the country or develop the interstate highway program or the space program or the State land grant university program. We have been doing that sort of thing for our entire history.

Unfortunately, we have now hit this wall of resistance, and I do not think that has been very productive. I raise this point because this is one of the realities in the political forum in which we deal, the government forum, on which we all have to focus. What we have to do is make clear that we are not going to reach the kind of goals you were talking about so eloquently, Mr. Longuemare, without this kind of cooperative effort.

If I could very quickly ask you a final question. Are we losing some of the best people to manage this program in the Defense Department and the Commerce Department? Do we have the capability in the Federal Government to manage the kind of goals you are talking about, Mr. Longuemare?

Mr. LONGUEMARE. Well, let me say that I think you are touching on a substantial problem and there is no question that there has been an exodus of some very key individuals. As we are all aware, there is some difficulty now in finding some replacements in some areas to step up to these things.

I do believe that the environment today is certainly not conducive to many people wanting to take on these roles. I think it is a potential problem. But that is something that is well beyond the subject we are talking about here.

Senator WIRTH. No, it relates directly to what we are discussing because you cannot get from here to there unless you have the people who are able to manage the system in the Defense Department or the Commerce Department or elsewhere.

Mr. LONGUEMARE. There is no question about that. We certainly need high caliber people.

Senator WIRTH. Absolutely.

Mr. LONGUEMARE. It is not an easy job to get them.

Senator WIRTH. You know, this probably results in part from people being underpaid for this type of work and we are seeing an exodus of people because professionals are being underpaid, and because of the various hoops that they have to dive through in order to get a high-level government position.

I raise this point, Mr. Longuemare, because I think that you all can be very helpful to us in saying that we have national goals that need to be met, but we cannot get from here to there without quality people to manage the programs.

Those of us who would like to do what we can to raise compensation for the top quality people in the Federal Government, and make it easier for people to come in, need help from the outside. We could do all of these things if we had the quality of people to manage the very, very sophisticated set of goals which you are laying out.

Mr. Longuemare. You are right on.

Senator Wirth. I think my time has long expired. Thank you, Mr. Chairman.

Senator Bingaman. Senator Coats.

Senator Coats. Thank you, Mr. Chairman, and thank you both for your testimony.

APPLYING NEAR PERFECTION STANDARDS

I wanted to ask a couple of questions here, one of which, Mr. Galvin, you state in your testimony that you think by applying the standards, the near perfection standards that you prescribe, that a lot of industries that now are reluctant to participate in the defense business would come back into or want to enter it.

Yet, I reentered the business. Yet, when I look at the quality standards that you set—defects reduction from nearly 67,000 per million opportunities per error to three by the year 2000, is that really realistic, to think that our defense industry or our industries in this country, that looking at that reduction in standard would conclude that they are capable of coming in and meeting that requirement? Would that not have just the opposite effect? Would they not look at that and say, "we cannot begin to achieve that level of perfection that Congress is now demanding of us?"

I think it is a very admirable goal to set and I commend you and Motorola for setting the standard, and I do believe setting that kind of standard drives changes that bring about efficiency. But I am just wondering how many share that view, and I wonder if you have had the opportunity to share that with any of your colleagues in industry.

Mr. Galvin. Well, let me see if I can explain. The recommendation comes as a result of an experience and a set of experiences Motorola has had as a vendor to world class customers.

When we first went to Japan, many of you have heard the story of Motorola entering the beeper business in Japan. NTT set a specification of a mean time between failure of about 7 to 8 years for their particular pagers. In the early 1980s, we were the world's largest suppliers of pagers and our mean time to failure was about a year to a year and a half.

We said that is a barrier to entry. That was our first reaction. Then we got their products and we tested them. We discovered, in fact, that they had achieved a reliability result that was far in excess of our capability at that point in time.

We chose to engage with this world class customer in this particular area of improvements. What has occurred is that the mean time between failures for Motorola and pagers that were measured in years went from 1981 until 1986 to measuring it in decades. Today this pager is measured in centuries. It is about 150 years mean time between failure on this particular pager on a calculated basis.

So, for those that have had experience with customers that reach for very high levels of quality, that participate in the exchange of technology and participate in the tradeoffs, and conduct themselves in a way that allows this process to occur, it is extraordinarily stimulating. Ford did this for us in our automotive business as well.

If the Defense Department first starts with its own leadership, the Defense Department has to learn how to execute this process. It has to learn statistics. It has to learn how to identify what errors are. It has to go back and revisit some of its procedures, the way it interfaces with suppliers. This would be a driving force for people to say, "If I employ that process, like some people are employing the Malcolm Baldrige National Quality Award audit process today to improve themselves, it would create a very unique dynamic to change the institutions for both the supplier's institutions and the Defense Department's institutions."

Again, I go back to this issue. Leadership is a minority activity. When John Kennedy said—and there are many other examples like this—"Almost always the leader, who sets goals to which people say, I cannot achieve them, discovers later on, that those people are the first 5 years later to say, Boy, that was a great idea."

There are two kinds of laws responding to this issue of how we get people's attention. I oversimplify it. There is reactive law and there is causative law.

When we have abuses in the system where we have these $600 toilet seats, we cause reactive law to occur and we attempt to fix those kinds of abuses, if they are real, and that is always contested.

Then there is a causative kind of law, a proactive kind of law. That is the kind of thing that is being proposed in this quality initiative, that drives changes before people realize that there is need—really, they understand the need for it and it is not until they engage the process that they develop the conviction that there is a need for it. That has been our particular experience.

Most of the senior officers in Motorola did not believe this was possible when we set out the goal. About a year after working at it, being forced to work at it, they said that this thing can really work. Now we are training everybody in statistics and we are engaging a process that allowed us to win the award and win back a lot of our customers around the world.

When we have a level playing field, we are able to beat the Japanese every place we are. I think you have all heard or seen this particular product, but this is the new cellular telephone, the one that has been spoken about, or printed, various stories about.

This is a product that by employing this process, we think we are 6 to 8 months ahead of the Japanese in technology and in quality, and it is being done in Arlington Heights, Illinois, just outside of Chicago.

Senator COATS. If you had pulled out of your pocket a Midgetman Missile and set it down [laughter] I would really be impressed. I am impressed anyway and I commend you——

Senator BINGAMAN. I would have cleared the room.

Senator COATS. I commend you and Motorola for not only setting the standard but for demonstrating that those kinds of things can be achieved.

I guess I have to take a little bit of exception with my colleague from Colorado's description that it is only the shrill cry of the ideological right that prevents us from having a federally-directed capital allocation that will result in the kind of nirvana that we are seeking here.

I think assuming that Members of Congress have the insight and the foresight, the experience, and the depth of knowledge necessary to decide where capital should go and where it should be engaged and the kinds of endeavors that we should be involved in 10 and 20 years out, I think some of us share a great distrust of that being overwhelmed by the political realities that we deal with.

I cannot tell you how enamored I am with the way capital is employed in the State of Indiana and the companies that are producing products for the Government. Somehow, if it is produced in Indianapolis, it just seems so much superior than something produced in Colorado. [Laughter.]

My tendency is always to look on the positive side of the use of that capital, as opposed to being objective in saying that a company in Colorado or an endeavor in New Mexico, or whatever, is superior to what is being produced in Indiana.

I am just concerned that the political reality that we deal with here in terms of representation of our constituents and the very human tendency to want to direct it in ways that benefit the people that we represent would overwhelm a dispassionate objective analysis on the part of my colleagues and I in determining just how that capital ought to be steered.

I guess that is why some of us tend to want to let the market sort that out rather than make that decision on the floor of the U.S. Senate. That is not a question. I guess I'm just curious as to what your response might be.

Mr. GALVIN. I can only say that I agree with all of the political realities of making that process work. Again, I will come back to say that the reality of the results that will occur over the next 15 to 20 years will create an environment in Congress and in Washington that will allow you to catalyze and respond to this issue.

All that is happening is that most people have to see the implications of the policies of today come in the results tomorrow before they can develop the conviction to act. That will allow the self-interest to go away when the results come in, like they did in the dynamic ram business and a few other things that caused Sematech to occur.

So, we just simply have to wait for enough stimulation for that now to occur.

If I could just—not taking too much of my associate's time—respond to Senator Wallop's comment about what is really happening with the total quality management initiatives in the Defense Department and how they are doing, and what you have.

My message here is basically a positive one. That is that there are islands of excellence in the Defense Department that are islands in world class—General Loh's system command out at the Air Force, Wright-Patterson Air Force Base, the streamlining processes that people are working on—there are many examples of very fine things that are going on there.

The interesting dilemma is that in pursuing quality, significant cost reduction, reliability, and a significant improvement in cycle time, no one knows yet how high the goal is. I mean, what does have to be attained? And no one yet knows when it has to be attained.

If the stakes can be put in the ground with reasonable milestones, you can begin directing people in concert to moving now in one direction. That is really the message of this thing. It is not that people are not trying hard. It is just that there is not a unifying overriding goal that is directing everybody to work at the same time on the same thing—getting everybody to work on it simultaneously so as to achieve the significant cost reductions and improvements in effectivity that are possible.

Senator COATS. Thank you very much. My time has long expired. I appreciate your testimony.

Thank you, Mr. Chairman.

Senator BINGAMAN. Thank you. Let me follow-up. I will ask a few additional questions, if the two of you can bear with us a little longer.

Mr. Galvin, your idea intrigues me. I guess what I am trying to grapple with is what we in Congress this year can do to begin this process. You have identified that really what is needed is for someone to be directed to put the stakes in the ground.

I guess what you are saying—and you correct me if I am wrong here—but what you are saying is that the Congress should direct the Department of Defense in two respects to establish goals for improvement of how things are done so as to get to this no-defect situation.

First, as a customer, become a world-class customer so that we could establish what our goals are for the things we are buying, for the services we are buying, the products we are buying. Obviously, it is easier in the case of products to put those stakes in the ground.

Second, in the way the Defense Department functions. They should also have clearly-identified goals where you can statistically measure progress from where we are to where those goals are.

I believe what you are also saying is that another factor everybody seems to agree on is that if we were to try to set some goals here in Congress that we did not have the responsibility to implement, that would be a useless act. The people who are going to be trying to implement these goals, or reach these goals, have to actually set them.

What you are, I believe, suggesting is that as part of a quality management system for the Department of Defense we should direct someone to do the statistical analysis, come up with the goals internally and as a customer to the outside world, and give the Department of Defense a certain period of time to do that so that we then could be in a position to measure progress over the next several years.

Why don't you respond to all that and tell me if I am on track or off track.

Mr. GALVIN. In essence, that is the idea. I did not come here today with a specific piece of legislation prepared nor specific recommendations in that area. It was designed to attempt to capture people's imagination to go pursue what would be likely an effective vehicle to accomplish such a thing. But you described it accurately.

I would only emphasize this: whatever is asked to be done has to be done on a global or overall objective basis. I mean, on a broad scale. Allow the people that are the experts to change the system from within.

The first reaction to this kind of initiative, depending on how either the legislation or the regulations are written, is the contracting officer will say, "Oh, good, I will just put this additional specification as a line item in the next acquisition request I have."

That is probably alright because that is generally the first phase of how these processes work. Again, however, if people are held to the fact that they have to achieve an overall result at some point in time in the future, they discover that the system cannot support it and they have to fix things first in the Defense Department—and I just changed the order of how you related them—because DOD has to behave differently, and then, second, the suppliers can interact with them and then aggregate the goal.

We can work together subsequent to this meeting to look for what would be an appropriate vehicle, or maybe some vehicle that would have some effect, in terms of trying to prioritize this management of process over the management of detail, or the management of how it has been approached generally in the past, and attempt to put people in motion from a leadership standpoint in working the issue.

Even if it is not achieved in its entirety by the year 2000, if one got to a Five Sigma level or a 233 defective parts per million in everything that went on, you would achieve about 90 percent of the cost reduction and effectiveness of improvements just by putting people in motion.

Senator **BINGAMAN**. I would welcome the chance to work with you on something on this general subject because I think it is the big picture and it may be a better way to approach things than the brick by brick approach that we have pursued for a great many years around here.

Mr. Longuemare, let me ask you. I first compliment your association for the work you have done in identifying some critical technologies. We, of course, had a critical technologies report prepared by the Department of Defense and the Department of Energy in the defense area, which they submitted to us here about 2 or 3 months ago, on March 15. Many of the same technologies are in there.

We are now in the process of trying to determine how you go from the identification of these key technologies to a strategic plan to get from where you are now to where you need to be to actually use the technologies in a product like that phone that Mr. Galvin pulled out of his pocket.

Are you doing that very same thing? Is your organization preparing a strategic plan for each of the critical technologies you have identified?

Mr. **LONGUEMARE**. Yes, it is. Our organization started out with the overall concept of coming up with this and identified 10 key technologies which we felt met these various criteria. By the way, there is great congruency between those 10 and those that have been identified in these other independent studies, which is very encouraging.

The next step after that was to prepare detailed roadmaps, as we call them, which are essentially strategic plans for each one of the various technologies, the 10 that we have selected. Those are in various stages of development and one of those is included for the record.

The following aspect, then, is to prepare what we call technology development plans, which are more detailed plans to flesh out these technology roadmaps. So, we are indeed trying to take the initiative there.

I might mention that this is being done by these multi-disciplined teams of not only industry but also members of Government, DOD, and also the academic community. We are trying to start this whole process now by involving all the expert people who are parties to this in various stages and seeing if we can come up with a consensus.

We are very encouraged because of the progress that has been made so far. We hope that we will have maybe not all the answers, but at least a blueprint that can be used as a mechanism to at least start this.

Senator BINGAMAN. When would you expect to have those strategic plans completed?

Mr. LONGUEMARE. We should have the bulk of them done by the end of this calendar year.

Senator BINGAMAN. My time has expired. Senator Wirth.

Senator WIRTH. Thank you, Mr. Chairman. Let me pick up on that, if I might, Mr. Longuemare.

ROADMAPS

You talk on page 8 of your testimony about the roadmaps. You have completed four of them for rocket propulsion, advance sensors, artificial intelligence, and software development and four more in coordination, air breathing propulsion, advanced composites, ultra-reliable electronics systems, and optical information processing. Two are just being started on superconductivity and computational science.

Those are the 10 that you have chosen, and there seems to be a lot of overlap with what we got in March.

Mr. LONGUEMARE. Yes, sir.

Senator WIRTH. What do we do? If you were sitting where I am sitting, listening to this? What do you want the Congress to do?

Mr. LONGUEMARE. There are a number of things that we would like to see happen. Of course, probably the most important one, to begin with, would be a policy statement from your branch that would indicate support for this whole approach.

Senator WIRTH. Do you know what such a policy statement ought to say?

Mr. LONGUEMARE. We would be glad to work with you in coming up with the details of this. Yes.

Senator WIRTH. Could AIA give us your best sense of what such a policy statement ought to say?

Mr. LONGUEMARE. We would be pleased to do that.

Senator WIRTH. That would be great.

Mr. LONGUEMARE. Yes.

[The information follows:]

The Aerospace Industries Association (AIA) supports a stronger, better focused U.S. technology development effort needed to revitalize America's worldwide industrial competitiveness. A bold new national commitment is required, aimed at bringing forth U.S. products of undisputed excellence to reestablish our nation's marketplace leadership. We must strengthen the cooperative development process, provide participatory mechanisms for national focus and encourage free trade within our industry's international markets.

"Key Technologies for the 1990s" is AIA's approach to assuring that vital innovations will be ready for potential commercial and defense applications in the early years of the twenty-first century. Our approach, equally applicable to other major U.S. industries, is based on a "leapfrog" concept with the goals to significantly increase productivity and quality, and drastically cut the time taken between technological concept and market introduction.

To implement this coordinated program, the industry has established The National Center for Advanced Technologies. This National Center, also known as NCAT, is an industry-sponsored Foundation to provide objective, impartial management oversight to coordinating and integrating the direction and development plans relating to selected key technologies. For aggressive pursuit in the coming decade. However, while these specific R&D areas were identified by the U.S. aerospace industries it should be emphasized that these technologies will have broad, multi-industry, multi-market, national implications.

The Technology Policy Forum, an aerospace industries established organization is a volunteer body of senior policy and decision makers from government, university and industry. The Forum identifies and projects future national needs and impediments to technology development, oversees the broad technology process and facilitates cooperative, participatory efforts.

The foregoing represents our underlying draft policy statement. We are pleased to set forth the following implementation recommendations for the Subcommittee's review and consideration:

1) Endorse the concept of the "Key Technologies for the 1990s" program - an entirely industry-lead initiative - and the cooperative government, industry and university body known as the "Technology Policy Forum" to oversee its development.

2) Encourage the Chairman of the Subcommittee on Research and Development of the HASC to be a member of the Technology Policy Forum, thereby assuring national strategic guidance to the Forum's deliberations.

3) Propose that the Technology Policy Forum identify, evaluate and provide direction regarding technology demonstration models, and report their results concerning such models to the Congress within one year. Examples of recent demonstration programs aimed at providing prototype integration approaches include the Integrated Electronics Warfare Systesm (INEWS) and the National Aerospace Plane (NASP).

4) Endorse the concept of the "National Center for Advanced Technologies" (NCAT), a non-profit foundation and its responsibilities regarding coordinating, integrating and promoting the Key Technologies development efforts among industry, government and the university community.

5) Assure funding support is provided by appropriate government agencies to develop a technologies data base, the basic, generic information resulting from which will be provided government, industry and academia to expedite development efforts at minimum cost to government and industry.

6) Encourage NCAT, in conjunction with the National Institute for Standards and Technology and other government, industry and academic organizations, establish an unclassified technology data base and a schedule to make certain that the most useful, highest leverage information is given national development priority.

7) Endorse continuing and increasing government agency participation on the Technology Policy Forum to assure that principal technology development is expedited.

8) Assure that technology-related budgets are funded adequately and in a multi-year, stable manner, particularly in the strategically vital Tech Base area, i.e., 6.1, 6.2 and 6.3A.

9) Increase funding for manufacturing and processing technologies, giving emphasis to programs providing greater design/production integration. To provide adequate oversight for the most important are as, established programs such as MANTECH, IMIP, and RAMP as specific line item programs rather than sub-sets of the Industrial Preparedness Account.

10) Authorize the Department of Defense, in conjunction with the Department of Education, the National Science Foundation, The National Academies of Science and of Engineering, The Office of the President's Science Advisor and others , to develop a program and initiate action to rapidly and comprehensively improve mathematics and scientific education on the elementary and secondary levels. This program should have as its essential objective to enhance the interest amoung young adults to enter academic and career fields of engineering and science.

Senator **Wirth**. Okay. So, we do the policy statement.

Mr. **Longuemare**. That gives backing for the whole thing. Then there are a whole number of related areas which I touched on somewhat, in terms of the acquisition process and all, which, of course, is far beyond just what our immediate concerns are. Having some priorities, for example, in streamlining the area of technology procurement there would be, certainly, some benefit there—also, some tax relief in terms of being able to encourage this whole process.

I think also in terms of the emphasis, relative to the DOD initiative, where there has to be, again, a cooperative activity. A lot of this could be stimulated by the proper emphasis that would be given through this process.

One of the things that we are doing in terms of coming up with these various strategic plans, as you referred to them, is to try to recommend some of these demonstration programs. I think the demonstration programs represent a way to pull together these diverse activities that are going on into something that will ultimately result in not quite this, because that takes a while longer, but at least sets the stage and the direction to accomplish this 10 years out.

So, the answer is a combination of all these various things—and we would be glad to work with you folks in trying to flesh some of this out.

Senator **Wirth**. We would appreciate just getting a roadmap of what you think we ought to do.

Mr. **Longuemare**. Yes.

Senator **Wirth**. It is very easy for us to rhetorically develop a policy statement that appears somewhere and everybody feels good about it. It seems to me, we have to grind our way through a lot more specifics here in terms of getting this to—or, encouraging this to happen at DOD.

In that you can certainly help us. We might know what the policy goal is, the roadmap to get from here to Chicago. But what route do we take along the way? That is one.

It seems to me a second item is—as we have a new administration—to make sure that this set of issues gets up higher on their agenda. That is very, very important early on. When any kind of a new group comes in, whether it is in the administration or here, what you start on is very important. As they are starting on the problem of wrestling with this enormous budget problem and what weapons systems to cancel, and all of the day-to-day items that they are getting involved with, we could have 2 years or 3 years go by and be exactly where we are today.

So we also have to figure out how to make this a high-priority there where, as you said, Mr. Galvin, we function as the board of directors of this. We also have to figure out how to encourage the administration to put this high on the list.

There are some very good people coming into the Pentagon at the highest level. The new Secretary of the Air Force who has had RAND experience, is a perfect example of the need for us as a board to impress upon them as the operating officers of this enormous corporation that these are priorities we want them to pursue.

You know that. I know that. What I am asking for us is any help that you can give us in how we get from here to there.

Mr. LONGUEMARE. Well, we were certainly hoping that that would be your response, and we would be delighted to try to comply with that.

You articulated the problem well. It is certainly a broad-scoped problem and we need to come up with some specific things because generalities and waving the flag is not going to get us where we need to go.

I might comment, by the way, that I mentioned the DOD, but it is certainly not restricted to DOD. It goes across the board to every one of the activities that are going on.

We would be very pleased to work with you.

Senator WIRTH. Fine. Just as a closing note, let me again go back to what I was talking about in terms of our ability as a government to manage these tasks, to manage the national defense, to manage our national economic interest.

I am struck, particularly in the last 6 months by the very, very real problems we have regarding major professional people leaving the Government. Some of the key mid-level people are getting to the point where they have children old enough to go off to college. Many mid-level Government professionals are leaving because they cannot afford to work for the Government or because they can go to work for somebody on the outside doing somewhat the same job, but making two or three times as much money. As a result, talented people do not see the Government as their future.

I think that that is a very, very severe problem and it is going to get dramatically worse.

We have to have your support in this. We are loading a lot of burden on to you, but we are all in this together. We have to have your support in helping to illustrate the size and scope of the problem.

The American public has a natural suspicion of large Government or Government and bureaucracy. On the other hand, we have to put a value on that—that that bureaucracy is enormously important. We have to nurture that if we are going to expect good governance and management of the public policy process. We are going to have to have help in doing that.

We have been beating up on the Government now for a decade. I suspect that as people are departing in part because of financial reasons and in part because of morale reasons. They are not going to do a good job if they are constantly told they are bad people. You know that and we know that. But I would just say again that this is important. We cannot make it without the ability to manage.

Thank you very much.

Mr. LONGUEMARE. Thank you.

Senator WIRTH. Good, clear testimony. You are both terrific and we appreciate your being here. Thank you very much.

Senator BINGAMAN. We do appreciate your testimony very much. Mr. Galvin, we will follow up with you and try to get something specific that we could pursue in this year's Defense bill.

Mr. Longuemare, thank you very much. We want to work with you as we continue to try to move ahead on some of these critical technologies.

Senator WIRTH. Mr. Chairman, may I——

Senator BINGAMAN. Yes.

Senator WIRTH. While you are on it, Mr. Longuemare said that first of all they would like to try to take a cut at what a policy statement along this line might look like in terms of these critical technologies. A second issue is what additional steps we ought to be taking.

I asked them if they would submit to us what they think a broad policy goal ought to be, and what we need to do to help get that implemented.

Senator BINGAMAN. That would be very useful.

Mr. LONGUEMARE. Yes, sir. Be glad to.

Senator BINGAMAN. Well, thank you both very much. I think it has been a useful hearing. I have statements here to be submitted for the record by Professor J. Ronald Fox of the Graduate School of Business Administration at Harvard University and by Mr. David G. Soergel of the Vebel Society, Inc., a nonprofit public interest corporation.

[The statements referred to follow:]

THE DEFENSE ACQUISITION PROCESS:
DEALING WITH PERSISTENT MANAGEMENT PROBLEMS

Professor J. Ronald Fox
Harvard University
Graduate School of Business Administration

Good morning Mr. Chairman. I'm pleased to submit this testimony to assist in your oversight of the defense acquisition process.

During the past few years there have been so many criticisms of defense acquisition, that it's important to point out that there is much that is right about defense acquisition. Today the United States develops and produce the most advanced and sought after weapon systems and equipment in the world. And it does so by drawing on the engineering and manufacturing capabilities of the defense industry, and by the efforts of some outstanding people in the Army, Navy, Air Force and the Office of the Secretary of Defense whose careers have been dedicated to procurement and acquisition. All too often they are not given credit for the difficult jobs they perform.

Within that context, I'd like to make some observations about persistent problems confronting government and industry in the defense acquisition process, and the obstacles to dealing with these problems. In particular, I'd like to highlight cost problems. As you may know, the Under Secretary of Defense for Acquisition and others inside and outside the Defense Department believe that as much as $30 to $40 billion might be saved out of an annual acquisition budget of $130 billion if significant improvements can be made in the management of the acquisition process. Toward that end, the military services now have underway a number of initiatives to improve management of the acquisition process. They include actions to develop an evaluation program that will use contractor past performance as a consideration in source selection decisions; actions to increase the use of award fee contracts; and actions to develop and implement a total quality management program. These and other initiatives must be implemented successfully if we are to achieve the potential cost savings in the acquisition process.

But producing results from these initiatives will require sustained effort by those currently carrying acquisition responsibilities, and by their successors as well. That sustained effort may or may not occur. In the past, acquisition improvement programs have often been sidetracked after a senior manager in a military service or in the Office of the Secretary of Defense has left the Department, or is reassigned, and direction changes.

Every few years, a government commission or Blue Ribbon Panel is appointed to study problems in defense procurement. The commission or panel usually addresses problems of high costs, incorrect billings, schedule delays, and technical performance shortfalls. And each time, they recommend most of the same cures -- more competition, more prototypes, multiyear procurement, economic order quantities, better cost estimates, less gold plating. --But within a year or two implementation efforts fall short, recommendations fade away, and a new set of procurement problems emerges.

As I reviewed the previous attempts to bring about improvements in the acquisition process, it became increasingly clear that the deficiencies of the past have not been in the number or quality of the ideas for improvement. Rather, deficiencies usually develop during the implementation efforts. Failure to adequately train personnel to understand and implement new ways of operating, as well as failure to place adequate controls on the amount of information or level of detail to be collected, can easily result in failure to effect the improvement intended. Experience has taught us that a good idea can soon turn into a bad idea as it travels through several levels of management and each level elaborates on the idea.

Despite the problems in previous efforts at improvement, however, I believe that we now have an unusual opportunity to make significant improvements in the acquisition process: a new Congress and a new Administration are searching for ways to deal with a large federal deficit; the Justice Department is involved in a major investigation of conflicts of interest and of improper costs, and President Bush has made a commitment to major reform in defense acquisition. There may never have been a better opportunity to produce lasting acquisition improvements.

Let me review the acquisition management job facing the Defense Department:

Managing large the acquisition projects means overseeing and controlling the work of hundreds of the largest firms in the country--firms with highly experienced managers familiar with the defense acquisition process, and with methods of cost estimating, measuring progress, allocating overhead, calculating profits, and measuring return on investment. In seeking to accomplish that task, a serious flaw frequently emerges in the Defense Department model for overseeing contractors. The flaw lies in the assumption that it is possible to define a large development and production project, in advance, in sufficient detail to write a fixed-price type contract. That model is repeatedly applied and promoted by a number of well-intentioned people on Capitol Hill, and at times, in the Pentagon, who fail to understand the conflict between fixed-price contracts and the nature of large development and production programs.

In reality most large defense programs undergo incremental definition, often incurring many changes throughout the development and first production phases. When that occurs, weekly, sometimes daily negotiations, formal and informal, between government and industry, are a way of life. Fixed-price and incentive contracts often inhibit or prevent the necessary analyses, cost/performance tradeoffs and frequent negotiations.

In that acquisition environment, some government managers deal with contractors as adversaries, failing to achieve the informal cooperation so necessary between buyer and seller of any large development program. Other government managers see themselves as no more than partners with industry, adopting industry cost estimates with insufficient question. They share industry's goal of producing technically excellent programs, but they are unprepared for, and sometimes unaware of the buyer-seller negotiations that occur throughout the lives of these programs.

Realistically, managing the defense acquisition process requires a critical balance between the adversarial and the partnership roles--a balance that produces what I call the "wise buyer." Achieving that balance requires an in depth understanding of contractor operations, skill in cooperating with contractors, skill in conducting negotiations, and skill in dealing defensively with the marketing tactics within government and between industry and government. What is needed is not an adversarial relationship but, in the words of an American Bar Association report describing the defense acquisition process: "a business relationship characterized by rigorous bargaining, seeking the best interests of one's own side."

Unfortunately, however, obstacles often obstruct the achievement of the wise buyer role. These include the incentives inherent in the acquisition process, and the scarcity of industrial management skills among government personnel assigned to the process.

First let me comment on the industrial management skills.

The military services are appropriately designed for combat. It is obvious that a military officer cannot be assigned as a wing commander without years of flight training and carefully programmed flying assignments. By the same token, however, a pilot cannot manage effectively a complex industrial program without extensive training and carefully programmed acquisition assignments in business management and industrial cost control.

It is now clear that large development and production programs require training, career development, duration of assignments and length of career, radically different from that required for combat.

In a 1986 study of defense acquisition, the GAO found that many government program managers were simply not equipped to tackle the problems of weapons procurement. That finding was supported by field interviews and congressional testimony. During Senate Armed Services Committee hearings Mr. Norm Augustine, Chairman and Chief Executive of Martin Marietta and former Under Secretary of the Army was asked if most defense program managers had the necessary training and qualifications to perform their jobs. Mr. Augustine responded:

> I would say that in many cases they truthfully don't. We do much better than we did 10 years ago, but it is not uncommon for someone who has been commanding a ship at sea or a division or squadron to suddenly be placed in a position where they have the job of overseeing the work of an industrial giant.
>
> It is pretty tough to be equipped to do that when one comes out of a military operating force. It would be much the same as taking somebody

> like myself and putting them in charge of an air wing; it would be a terrible mistake.

General Jim Stansberry, former Commander of the Air Force Electronic Systems Division recently expressed similar views:

> There is a widely held belief in the services that the weapons acquisition process is a "secondary specialty" that anyone can learn. In reality, we need to create a program management career and a professional program management organization, not half a career in acquisition and half a career in operational commands.
>
> I have really turned around on this point. I used to think that the fifty-fifty arrangement was the best one.

David Packard expressed similar sentiments several months ago in testimony before the House Armed Services Committee.

In considering the training and qualifications of government managers, it is important to note that many military officers and government civilians have extensive academic education and general service training. But academic training rarely provides the practical knowledge and street smarts required to cope with the aggressive business tactics of the acquisition process. Academic degrees are no substitute for more practical training and practice in evaluating contractor schedules, costs, and technical performance; practice in negotiating solutions to day-to-day problems; or practice in motivating government and industry personnel.

Managing the acquisition process well requires that government managers have at least one full-year of practical training in business management and industrial cost control. That training should make them familiar with the acquisition process, with the problems that occur, and with the practical alternatives for dealing with problems. Very little of that training material exists today. To fill that void, the Defense Department needs to assemble hundreds of examples of acquisition management problems and describe the strengths and weaknesses of alternatives for dealing with them. Instructors will need a practical knowledge of the field and be skilled in guiding student discussions, rather than in delivering lectures. The training program should use simulation exercises, role playing, and case studies to provide practice in analyses, in decision making, and in implementing decisions. An internship in a program management office should precede and follow the one-year program.

Results from such a program need not be years away. If the Defense Department expands its efforts now, it can produce major improvements within two years.

The senior acquisition executives and the senior officers in the acquisition commands should be highly skilled in managing large industrial programs. Once selected for these positions, they should have sole responsibility for materiel acquisition and personnel recruitment, selection, and assignments in their fields.

That leads to the second obstacle to achieving excellence: The incentives that apply to industry, and to government managers.

I believe that the acquisition problems of the 1980s, including the recent instances of improper costs charged by some contractors, are not aberrations; they are the result of many people reacting in perfect accord with the incentives inherent in the process. At present, Congress and the Defense Department often present industry with rewards and penalties that are the inverse of those that normally exist in the commercial world. For example, on many defense programs, contractors and government managers are rarely rewarded, and at times are penalized, for lower than planned program costs.

The lack of more appropriate incentives has been a serious problem in most acquisition improvement programs during the past three decades. If the acquisition process is to run smoothly and efficiently, contractors should have an opportunity to earn returns comparable to their commercial returns, without undermining program objectives. When contractors perform well, they should be rewarded with improved opportunities for future defense business. On the other hand, when companies do not perform well, government managers should identify that performance and take corrective actions that may include penalties and contract termination. Defense Department officials at all levels must be prepared to support this kind of responsible management.

Equally fundamental changes should be made in incentives for government program managers. They should be rewarded for early identification of problems; and for success in controlling schedules, costs, and technical performance. The Defense Department should provide additional inducements, such as incentive pay to attract and retain acquisition managers. If an extra $15,000 to $20,000 a year were paid to selected military officers and government civilians and, if career regulations permitted military officers to remain longer in the acquisition field, incentives to retire from active duty would be substantially lessened. The extra cost would be negligible compared with the benefits from retaining experienced managers.

Other countries have taken similar steps. For example, Sweden's government acquisition agency attracts and retains senior people, (military and civilian) by a special law that allows an added salary increase for crucial acquisition positions. This provides prestige and draws highly qualified, experienced people to senior acquisition positions.

In summary, the Secretary of Defense, the military services and the Congress need to address three challenges:

> _First_, Develop and retain in government, far greater numbers of government acquisition specialists, at all levels, having a thorough working knowledge of contractor operations;
>
> _Second_, Establish more incentives to reward government personnel and contractors who maintain control of costs, and who reduce costs; and
>
> _Third_, Identify acquisition role models who have been able to control cost, and then reward, promote, and retain these role models in the acquisition field.

New source selection procedures, better planning and reporting systems, change-control systems, better forms of contracting, multiyear procurement, or more prototypes, have little likelihood of success unless government managers are highly skilled in applying these tools and unless the military services and defense contractors have a positive incentive to reduce the cost of acquisition programs.

Defense acquisition problems are primarily government-caused problems --not industry-caused problems. Many in government and industry _want_ to improve the acquisition process. But it is unrealistic to expect any lasting improvement unless major changes are made in government skills in industrial management, and unless more appropriate incentives and disincentives are established and enforced.

The acquisition process is a costly and important part of our defense establishment. Managing this process effectively requires that we retain the best government managers we have, and provide them with the prestige, the tools, and the incentives commensurate with the job we ask them to perform.

PREPARED STATEMENT OF DAVID G. SOERGEL

I believe that the non-competitive expenditure of over 90% of the Defense Department's applied research funds is a root cause for most weapon acquisition problems. Serious economic distortions are the consequence, such as;

1. economic concentration of the defense industry.
2. a take-it-or-leave-it weapons choice for military operators, at a take-it-or-leave-it price for taxpayers.
3. a dangerous narrowing of the surge mobilization base for high rate production, if needed.
4. a convergence towards monopolistic suppliers of major weapon-types.

A few paragraphs may help explain this complex cause-and-effect relationship. Whether privately or publicly funded, applied research technical activities begin the "innovative" process, which advances ideas for new goods and services to market. These earliest technical activities include low cost analyses and tests, which are aimed at gaining confidence in the initially uncertain projections of the idea's downstream production attributes, profitability, and market demand.

When (and if) applied research data and analyses demonstrate technical and market feasibilities, the partially explored idea will be advanced into the development phase of innovation. Usually, this phase of innovation is 5-6 times more expensive than the applied research phase, because it includes the design, fabrication, and test of a "hardware" prototype, and final engineering and full-scale test of the new good or service to ready it for production. While only a few creative scientists and engineers "invent" the conceptual idea and explore its technological feasibility during the applied research phase of innovation, many engineers and technicians, sometimes numbering in the thousands, advance the idea through development to production.

The innovation of new ideas is not unique to our form of government and economy. What sets the US apart from autocratic, commanded economies, however, is the economic freedom of individuals or groups to create and innovate new ideas, and to compete with others for a share of a common market. Most important, the creators and innovators of competitive ideas must be independent, and not collusive among themselves. If this were not so, consumers could not benefit by truly effective competition; i.e., a wide diversity of product choices and prices.

But who are these inventors/innovators? Some are well known, such as Bell Labs for the introduction of new goods and services based on the communication technologies. However, by far, the vast majority of independent creators/innovators are unknown individuals and groups, such as Chester Carlson, who was known by only a few prior to the introduction into office equipment markets of his "xerography" process for dry printing.

Since, within a free economy, the source for the next major innovation is entirely unpredictable, public policy governance of innovation must be neutral throughout the economy. For example, tax incentives to motivate innovation cannot be given to some individuals or groups, but not to others. Clearly, government must give all individuals and groups, known and unknown alike, equal incentives and authority to create their own ideas based on their own entrepreneurial selections of technologies. And, finally, all individuals and groups, known and unknown alike, must be held responsible--succeed or fail--for the competitive performance of innovation, beginning from the applied research phase of innovation, and continuing through production, if production is required.

In short, it is my belief that the authority to make entrepreneurial selections of a new idea's technologies and overall design must be directly linked to the responsibility for the outcomes of these authorities. I also believe that innovation by itself is not enough. Because ideas are created by individuals, not by organizations of any size, all US policies must promote venture equality before the law for all Americans, and also promote the competitive innovation of independently created ideas.

But DoD's R&D policies neither promote venture equality before the law for all Americans, competitive innovation, nor do they promote a link between entrepreneurial authorities and responsibility for outcomes. And the reason for DoD's assault on the US's democratic capitalism political economy is found in DoD's non-competitive expenditure of billions of dollars of applied research funds.

Proof of this assertion is found in applied research federal funding data contained in NSF Report 87-314, and in DCA's Summary of the 1988 IR&D/B&P costs incurred by Major Defense Contractors. Adding up all of DoD's 1988 applied research funds, we find that DoD spent an estimated $6 billion of tax dollars. However, this amount of applied research funding, while more than supplied by the entire private sector, is still not as interesting as the distribution of these tax funds to applied research performers in both private and public sectors.

Of the total $6 billion, $1.4 billion was non-competitively spent by DoD for in-house applied research activities, which were performed by 30,000 publicly-employed scientists and engineers within 111 R&D laboratories, consisting of 120 million square feet of R&D plant, located on 6 million acres of tax-exempt properties. A small amount of the $1.4 billion total was non-competitively awarded to DoD's tax-exempt, non-producing R&D organizations located in the private sector, mainly universities.

But this non-competitive applied research expenditure is only the beginning. Also during 1988, slightly more than 100 of DoD's largest contractors spent another $3.7 billion of applied research funds, which they recovered back to their treasuries by simply billing the overhead of their 1988 DoD contracts. The $3.7 billion of recovered funds was not competitively awarded.

Instead, these funds, known as "IR&D/B&P" funds, are annually negotiated into the overhead of DoD's next year contracts that will be held by the 100+ largest contractors. During the next year, these contractors will spend and recover their IR&D/B&P expenditures up to the pre-negotiated limit. They spend these tax funds in hope of winning future DoD contracts by independently performing non-contracted technical and proposal activities.

The IR&D/B&P funds are, in fact, tax-deductable (by Section 174 of the tax code), tax funds. This puts taxpayers in the odd position of both paying and subsidizing the "new DoD business" ambitions of DoD's 100+ largest contractors. But this "new DoD business" enhancement role, financed by taxpayers' money, discriminates against newcomer designers. Not yet having any DoD contracts against which to bill and recover these up-front new DoD business costs, newcomers suffer a tax-financed "double whammy." Instead of access to US Treasury funds, newcomers must draw equivalent funds from out-of-pocket, when they attempt to directly compete against DoD's 100+ largest contractors. As can be easily seen, this patently unfair federal procurement policy tends to economically concentrate the defense industry by raising an artificial, tax-financed entry barrier to newcomers.

Slightly less than $1 billion of applied research contracts was awarded to industry through DoD's procurement system during 1988. However, federal procurement data is not cut fine enough to specify how much of this total was competitively awarded. My best guess is that only about $0.4 billion of the $0.9 billion total was competitively awarded, and then mainly to large contractors who, from my direct experience, often "buy-in" to these "tech base" applied research procurements.

Thus, during 1988, I estimate that DoD non-competitively spent 93% of its total applied research funds. These non-competitive expenditures locked-in the downstream production prices and other production attributes of many future weapons, long before they will surface into view for congressional authorizations and appropriations for completing development and production. Alternative, dissimilar technology weapons will simply not exist, signaling the loss of a hedging strategy against the remaining technological and mission requirement uncertainties. Thus, military operators will be given a Hobson's choice of weapon, at a take-it-or-leave-it price for taxpayers.

In conclusion, DoD's R&D policies feature a non-competitive "front-end" of weapon's innovation. These policies prematurely converge weapon's acquisition to the worst of all economic worlds: A monopsonistic buyer (a single buyer) supplied by a monopolistic seller (a single seller).

A major structural overhaul is needed, starting with the institution of new R&D policies which require the competitive procurement of DoD's 6.2-6.3 applied research funds, and defense industry's IR&D/B&P funds. The overhaul should extend to congressional committees. Congress should detach from micromanaging the Defense Department, and, by detaching, allow US taxpayers to enjoy the cost-saving benefits of effective competition between independent creators/innovators.

These "front-end" reforms of the weapon acquisition process, which I have conceived to bring weapon's acquisition back into the capitalist enterprise economic system from which it has badly strayed since WW-2, will substantally lower the up-front cost to enter DoD's huge system-level R&D markets. Newcomer system designers and current system contractors will both play on the same level-field, when bidding for new applied research, system-level design contracts.

Based on my R&D and contracting experience, dating back to WW-2 radar engineering at MIT's "Radiation Laboratory," I believe that new weapon system designers, with their new ideas and technologies, will "make the big sammys run far faster to stay in business" than any statute, regulation, or administrative procedure yet to be invented.

[Whereupon, at 11:01 a.m. the hearing was adjourned.]

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